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RESEARCH STUDIES OF THE STATE COLLEGE OF WASHINGTON



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AUTO-ANTIBODY PRODUCTION FOR BONE MARROW¹

VICTOR BURKE, CLOYCE F. BRADLEY, and N. P. SULLIVAN

During the past few years there has accumulated evidence that auto-antibodies can be produced experimentally. Guyer² has shown that when the lens of the rabbit eye is destroyed with a needle an antibody develops as indicated by the precipitin test. A rabbit injected with its own sperm developed spermatotoxins and its fertility was lowered.³ An antibody against germinal epithelium was also produced.⁴ Rous and Robertson showed that autohemagglutinins may arise as the result of the withdrawal of blood. This indicates that antibody formation does not always require the introduction of an antigen and possibly not the breakdown of homologous tissue. The same authors also obtained autoagglutinins by repeated transfusions of blood.⁵

The experiment described in this paper represents the first of a series designed to determine the possibility of auto-antibody production against other tissues. The choice of tissues to be used in the immunizing experiments was determined by the possible relationship to disease. Bone marrow was selected first because of the possibility of throwing some light on the cause of one of the various forms of anemia.

¹ From the Bacteriological Laboratories, State College of Washington.

² M. F. Guyer, "Precipitin Production through Lens Injury," *J. Infect. Dis.*, XXXVII (1925), 93.

³ M. F. Guyer, "Studies on Cytolysins: Experiments with Spermatotoxins," *J. Exper. Zool.*, XXXV (1922), 207.

⁴ *Ibid.* Thomas Lumsden and Alice C. Kohn-Speyer, "A. Natural Cytotoxins; B. Protection of Cells against Homologous Antibodies," *J. Path. and Bact.*, XXXII (1929), 185.

⁵ Peyton Rous and Oswald H. Robertson, "Auto-hemagglutination Experimentally Induced by Repeated Withdrawal of Blood," *J. Exper. Med.*, XXVII (1918), 563.

EXPERIMENTAL

Antigen was prepared from rabbit leg bone marrow by washing the collected tissue in sterile water for twenty-four hours in the ice box at a temperature of 3 to 5° C. The tissue was then ground to a fine paste with washed sand. Saline and 0.2 per cent tricresol were added. The sand was removed by centrifugalization. The dilution with saline and 0.2 per cent tricresol was increased to 1:50. The suspension was placed in the ice box for five days and then centrifugalized. Part of the cloudy supernatant fluid was saved for intravenous injection; the balance, filtered through cotton, served as the antigen in the complement-fixation tests for iso-antibodies. The sediment was used in the subcutaneous injections. The preparation of the antigen was such as to exclude the introduction and prevent the development of any foreign antigen.

The sera of all the rabbits used were tested for complement binding with this antigen before injections were begun. The rabbits were kept on a starvation diet for two days before bleeding. The injections were made according to the method of Daranyi⁶ and extended over a period of thirty days. The initial subcutaneous dose was 0.5cc and the intravenous 2.5cc. Ten to twelve days after the last injections the animals were bled and the sera tested by a quantitative complement-fixation technique for iso-antibodies. When an iso-antibody for bone marrow was found to be present the animal was bled to death and the serum tested for a complement binding antibody with antigen made from the bone marrow of the leg bones.

Five rabbits were immunized and all five developed an iso-antibody for bone marrow. All the animals were bled to death and the serum of each was tested for a complement binding auto-antibody with bone marrow from the same animal. The tests were made within twenty-four to forty-eight hours after the animals were killed.

The results obtained are given in Table 1. They clearly indicate that, when an antigen is prepared from rabbit bone marrow as described and injected into rabbits, these rabbits react by producing a complement binding antibody active in the presence of an antigen similarly prepared from the bone marrow of the rabbits injected. The results indicate the production of an auto-antibody, possibly for an

⁶ J. Daranyi, "Methods of Obtaining and Preserving Antibodies," *J. Immunol.*, XV (1920), 521.

antigen specific for the bone marrow, although the specificity was not determined. The presence of a nonspecific antigen in the bone marrow of the rabbit has not been reported.

It occurred to us that if an antibody for bone marrow developed and was active "in vivo," later injection of bone marrow should have less effect on the blood cell picture than the first injection. The following experiment was designed to determine this point.

EFFECT OF BONE MARROW INJECTIONS ON THE BLOOD PICTURE

Ono has reported that the intraperitoneal injection of a proper amount of bone marrow into a rabbit results in a definite change in the blood cell picture and in the bone marrow. There was "remarkable leukocytosis, erythrocytosis and reticulated erythrocytosis." Histological sections of the bone marrow showed "hyperplasia of the erythroblast group" and "a slight degenerative change in the bone marrow cells."

In our experiment, marrow from the leg bone of a rabbit was ground to a paste in physiological saline and then by the addition of more saline prepared as a 10 per cent suspension. Normal red and differential counts were made on three rabbits. Intravenous injections of the bone marrow suspension were made at irregular intervals over a period of six weeks. The first three injections were in 1.0cc. amounts, the fourth 1.5cc., and the last four injections 2.0cc. amounts. Duplicate counts of the blood cells were made and recorded, and changes from the normal noted.

The first injection resulted in a definite drop in the number of erythrocytes and neutrophils with an increase in the lymphocytes and the appearance of normoblasts, megaloblasts, and degenerate leucocytes. The lymphocyte count in general varied inversely with the erythrocyte count. The neutrophil count roughly paralleled that of the erythrocytes. Normoblasts and megaloblasts persisted throughout the experiment, but the first injection of bone marrow gave rise to a larger percentage of these than subsequent injections. A decided anisocytosis and poikilocytosis characterized the blood picture.

¹ Tashio Ono, "The Effect of the Components of the Bone Marrow Cells upon the Blood Picture and the Hematopoietic Organ," *Scientific Reports*, Government Institute of Infectious Diseases, Japan, VI (1927), 309.

TABLE 1.
Complement-Fixation Test for Auto-Antibodies of Sera of Rabbits Immunized to Rabbit Bone Marrow.

Tube	Immune Serum Rabbit	Antigen cc. 10 Units	Room temperature — 10-30 minutes					Comple-ment cc. 2 Units	6°-8° C. for 15-18 hours					Sheep Hemolysin cc. 2 Units	R. B. O. cc. 2%	38° C. for 1 hour					Normal Rabbit	Immune Guinea Pig
			1	2	3	4	5		1	2	3	4	5			1	2	3	4	5		
1	0.1	0.5*	+++	+++	+++	+++	+++	+	+++	+++	+++	+++	+++	+++	—	+++	+++	+++	+++	—	+++	+++
2	0.05	0.5*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++	+++
3	0.025	0.5*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
4	0.005	0.5*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
5	0.0025	0.5*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
6	0.1 cc. control	None*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
7	control 0.5 saline	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
8	control 1.0 cc. saline	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+++
9	control 2.5 cc. saline	None	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++

* Volume brought to 1 cc. with saline.

The experiment demonstrates that the injection of bone marrow in proper amount will produce a blood cell picture resembling that in anemia. The results agree with those obtained by Ono.⁸ Later injections caused similar, though less-pronounced, changes in some rabbits, whereas in other rabbits the later injections appeared to have no effect on the blood cell picture. This suggests that some rabbits, under the conditions of this experiment, develop a defense against bone marrow injections. This defense is active "in vivo." Its nature and the length of its persistence were not determined. In view of the results obtained in the first experiment, the auto-antibody for bone marrow that develops should be considered a possible factor.

The erythrocyte response to the subsequent injections of bone marrow extract varied with the individual rabbits. With one rabbit each injection resulted in a definite drop, though less pronounced following the later injections. With the other two rabbits the later injections seemed to have little effect on the red cell count. Following each drop the erythrocyte count started to return to normal. The attempt to keep the count down by frequent injections was not successful, as in some cases the return to normal was not checked by an injection. With one rabbit the red cells agglutinated spontaneously to such an extent that during the sixth week accurate counts could not be made and the use of this rabbit had to be abandoned. Autoagglutinins, active at room temperature, arose as the result of the injection of bone marrow.

What part or parts of the bone marrow serve as antigen, what part affects the bone marrow, and how it brings about changes in the blood cell picture and in the bone marrow should be determined. The fat of the bone marrow may cause an increase in the destruction of red cells and thus indirectly affect the bone marrow, or it may affect the blood cell picture by acting directly on the bone marrow or the whole reticulo-endothelial system. Fat may cause emboli and thus bring about a disturbance, but it is still necessary to account for the lack of disturbance following later, heavier doses. If the decreased effect of later injection is due to an antibody action, it would appear that the effect of the bone marrow injection was not entirely due to a lipid. However, when we ground and washed bone marrow in distilled water several times to remove cells and serum and injected a 10 per cent suspension intra-

⁸ *Ibid.*

venously into three rabbits, the resulting change in the blood cell picture was the same as when whole bone marrow was injected.

We had in mind in beginning these experiments that the sudden introduction into the blood stream of cells of the bone marrow might lead to antibody production against these cells. Such an antibody might conceivably bring about a condition resembling anemia. The immature blood cells are more likely to get into the blood stream than the balance of the bone marrow. We have yet to determine whether an iso-antibody for the immature blood cells in the bone marrow develops following the injections of bone marrow. We did, however, determine by the following two experiments that the anti-bone marrow serum is not active against mature red cells.

EFFECT OF MYELOTOKIC ANTIBODY IN THE BLOOD STREAM

To determine the effect of a myelotoxic serum on the blood picture a guinea pig was immunized to rabbit bone marrow. The animal received six injections of 2.0cc. of a ten per cent suspension of rabbit bone marrow, including the cells therein, at five and six day intervals. Fourteen days after the last injection the animal was bled. Red blood cell and differential counts were made on a normal rabbit. The rabbit was then injected with 0.5cc. of serum from a normal guinea pig. No change occurred in the blood cell picture. The animal was next injected with 0.5cc. of serum from the immunized guinea pig. There was a definite drop in the red cell count, an increase in the lymphocytes and eosinophiles and a drop in the polymorphonuclear leucocytes. The hemolytic action of the sera of the immunized guinea pig and that of a normal guinea pig were compared and no significant differences obtained. Apparently the difference in effect on the blood cell picture was not due to a hemolysin. The action of the anti-bone marrow serum on the cells in the bone marrow was not determined.

When a hemolytic serum from a guinea pig was injected a comparable drop occurred, accompanied by the appearance of immature cells. It appears, therefore, that the introduction of antibodies for either bone marrow or red blood cells results in a blood cell picture resembling that in anemia. We have shown that an auto-antibody for bone marrow can be produced experimentally in rabbits. We have no evidence that it causes a change in the blood cell picture of the animal. It appears to be active in the body of some rabbits to the extent of protecting

against injections of bone marrow from another rabbit. We injected the serum of a rabbit showing an auto-antibody for bone marrow into a normal rabbit. A slight drop in the cell count occurred.

Our work with the serum of the guinea pig immunized to rabbit bone marrow suggested that little if any of the antigen of the bone marrow is common to the mature red cells of the blood stream. The hemolytic action of guinea pig serum was not appreciably increased by injections of bone marrow. To supply further evidence concerning the action of anti-bone marrow serum on red cells, the following experiments were made.

EFFECT OF RABBIT ANTI-BONE MARROW SERUM ON RABBIT RED CELLS

Exposure of red cells of a normal rabbit to bone marrow serum, without and with the addition of guinea pig complement, failed to produce hemolysis. The red cells of a rabbit, immunized to bone marrow, laked with age at the same rate in the serum of the same rabbit and of a normal rabbit. The cells of a normal rabbit placed in the same two sera laked at the same rate. The serum of a rabbit immunized to bone marrow was absorbed with red cells and then tested for complement fixation with bone marrow antigen. Complement fixation occurred. Sanford's fragility test was made on red cells from a number of normal rabbits and from four rabbits immunized to bone marrow. The red cells from the bone marrow immunized rabbits were slightly more resistant to salt than the cells of normal rabbits—that is, the cells were less fragile than cells from normal rabbits. It appears that the auto-antibody for bone marrow will not produce disease by affecting the red cells.

DISCUSSION

We have shown that a complement binding auto-antibody for bone marrow can be produced in rabbits by the injection of bone marrow. Later injections of bone marrow had less effect than the first injection on the blood cell picture. The antibody for bone marrow may have been responsible for this. Whether such an antibody ever occurs in nature and is active in the living animal against its tissue and serves as the etiological factor in one of the various types of anemia can possibly be determined better in the clinical than in the experimental laboratory.

Since our experiments were completed, a paper by Schwentker and Rivers on iso-antibody production for brain tissue has appeared. They

obtained iso-antibodies with autolized brain but not with fresh brain.⁹ Our antigen used in immunizing and in testing for iso-antibodies was preserved in 0.2 per cent tricresol and kept at freezing temperatures up to five or six weeks, and we do not know whether any autolysis occurred. The tests for auto-antibodies were made within twenty-four to forty-eight hours after the animal was killed. The antigen was kept in the ice box, and it is doubtful whether any autolysis occurred. The effect of freezing on the antigen was not determined. Schwentker and Rivers did not demonstrate auto-antibody production for brain but speculate on the possible relation of such antibodies to certain diseases of the central nervous system.

Schwentker and Rivers also found a complement binding antibody in anti-brain serum for kidney, liver, and spleen tissue extract.¹⁰ This suggests that extracts of these organs should serve as antigens in iso-antibody production. During the past four years we have been successful in producing iso- and auto-antibodies for brain, kidney, adrenals, thymus, and spleen. Doubtful results were obtained with liver, and negative with pancreas.

Since we did not determine the organ specificity we may have been dealing with nonspecific antibodies. According to Fleisher, tissues have three kinds of antigen, one common to the species, one common to one or more of the other organs, and one common to the specific organ. He considers that organs vary and that an organ may lack one of these antigens.¹¹ We should expect the antigen specific for an organ or tissue to be more likely to stimulate auto-antibody production than an antigen common to other organs.

Auto-antibodies produced experimentally, such as those reported, may be against new antigens arising during the preparation of the antigen. Such antigens may also appear in the body following the death of tissue and the resulting antibody be beneficial rather than detrimental. Destruction of tissues within the body with a study of resulting antibodies and the effect on living cells offers a better approach to a solution of this problem. This method of approach has one difficulty:

⁹ Francis Faud Schwentker and Thomas M. Rivers, "The Antibody Response of Rabbits to Injections of Emulsions and Extracts of Homologous Brain," *J. Exper. Med.*, LX (1934), 559.

¹⁰ *Ibid.*

¹¹ M. S. Fleisher, "Relationships of Various Anti-organ Sera," *J. Immunol.*, VII (1922), 51.

in the average individual the cells may have a defense against auto-antibody action.²² Apparently some cells do not have such a defense.²³ A study of the diseased individual should be most fruitful. We have made a few complement-fixation tests of the serum of the insane for brain antibodies with negative results.

That body tissues or their products may serve as antigens and lead to auto-antibody formation or sensitization has been considered by various investigators. We will refer here to a few reports in which there is suggested a possible relationship between antibodies and disease.

According to Boxwell and Bigger,²⁴ autoagglutinins occur in various animals, including man, as the result of trypanosome infection. They searched the literature and found recorded what they consider twenty-two authentic cases of autoagglutinins in man. The data on each case are not complete, but they are significant in that eleven, or half of these patients, had anemia.

Guyer demonstrated lens antibody in some rabbits suffering with hereditary cataract.²⁵ Gifford reports that some patients suffering from cataract are hypersensitive to lens protein and can be desensitized by injections of lens protein. Some gave positive precipitin tests.²⁶

Duke has presented evidence that a woman may become sensitive to her own milk and be desensitized and milk secretion checked by injections of her own milk.²⁷ Harrison describes a patient having menstrual allergy, being skin sensitive to and cured by injections of menstrual extract.²⁸ There is evidence that the male foetus may act as a foreign body, an antigen.²⁹ The possible effect of the resulting antibody on the foetus has not been demonstrated.

Collip and Anderson demonstrated the production of antihormones following the injection of glandular extracts. There is some evidence

²² Lumsden and Kohn-Speyer, *loc. cit.*

²³ *Ibid.*; Guyer, *loc. cit.*

²⁴ W. Boxwell and T. W. Bigger, "Auto-hemagglutination," *J. Path. and Bact.*, XXXIV (1931), 407.

²⁵ *Loc. cit.*

²⁶ Sanford R. Gifford, "Allergic and Toxic Properties of Lens Protein: Immune Reactions to Lens Protein," *J.A.M.A.*, LXXXV (1925), 351.

²⁷ W. W. Duke, "Specific Hypersensitiveness to Own Breast Milk," *J.A.M.A.*, XCVIII (1932), 1445.

²⁸ W. T. Harrison, "A Case of Menstrual Allergy," *J.A.M.A.*, C (1933), 738.

²⁹ Joseph Needham, *Chemical Embryology* (New York: Macmillan, 1931), p. 1453.

that these antibodies may affect the homologous gland with increased glandular deficiency.²⁰

The evidence here presented is sufficient to indicate that antigens derived from an individual's own tissues or non-specific antigens having the same antigenic action should receive more serious investigation to determine their possible relations to disease through antibody stimulation. The fact that the possibility of auto-antibody production has not been investigated more fully is probably due in part to reported failures. Possibly some of these failures are due to the technique used.²¹

The occurrence of auto-antibodies does not indicate that disease will result. For disease to result, the antibody must be active "in vivo" and the tissues lack protection.²² Rous and Robertson²³ have shown that free antigen and antibody may circulate together in the blood stream. Autoagglutination does not usually and may never occur at blood temperature. However, isoagglutinins active "in vitro" at 37° C. and auto-agglutinins active at 31° C. have been reported.²⁴ The latter may be a factor contributing to death during chilling or freezing. Guyer's experiments²⁵ suggest that auto-antibodies may be active "in vivo" and result in disease.

Lumsden and Kohn-Speyer have presented evidence that body cells, with the possible exception of spermatozoa, have a natural defensive mechanism against auto-antibodies.²⁶ We should consider that this mechanism may at times fail to be effective.

²⁰ J. B. Collip and Evelyn M. Anderson, "The Production of Serum Inhibitory to the Thyrotropic Hormone," *Lancet*, I (Jan. 13, 1934), 76.

²¹ W. H. Manwaring, "Application of Serologic Technics to General Biologic Research," *J. Infec. Dis.*, LIV (1934), 81.

²² Lumsden and Kohn-Speyer, *loc. cit.*

²³ Peyton Rous and Oswald H. Robertson, "Free Antigen and Antibody Circulating Together in Large Amounts," *J. Exper. Med.*, XXVII (1918), 509.

²⁴ Philip Levine and Karl Landsteiner, "On Immune Iso-agglutinins," *J. Immunol.*, XVII (1929), 559; Irving Sherman, "Auto-hemagglutination," *Am. J. M.Sc.* CLXXXVIII (1934), 487.

²⁵ *Loc. cit.*

²⁶ *Loc. cit.*

CONCLUSIONS

1. Complement binding iso- and auto-antibodies develop in rabbits as the result of the injection of rabbit bone marrow antigen.
2. Anti-bone marrow serum is non-hemolytic. The mature red cells and bone marrow antigen as prepared are antigenically distinct.
3. The injection of bone marrow into rabbits causes changes in the blood cell picture resembling anemia. Later injections have less effect in some rabbits than the first injection. This indicates the development of a defensive mechanism of some kind. Possibly the antibody formed is a factor in reducing the effect of later injections.
4. Autoagglutinins active at room temperature appear in some rabbits following the injection of rabbit bone marrow.

FLORA OF REDWOOD PEAK, OAKLAND HILLS, CALIFORNIA¹

LINCOLN CONSTANCE

The Redwood Peak area represents the highest elevation of the Oakland Hills, and the climax of their characteristic vegetation. Here is to be found a small isolated forest of *Sequoia sempervirens* of peculiar composition, constituting the only stand in Alameda County and comprising one of the connecting links between the typical Redwood forests of the Northern Coast and their southern limits on the Monterey Peninsula.

Situated on the border of the populous Bay area, Redwood Peak is rapidly losing what little remains of the original character of its plant life. Years of excessive grazing, recurrent fires, and other factors have aided man in accomplishing a rapid deforestation of the area. Even now it is rather late to attempt to obtain an idea of the natural vegetation of the region, and, within a few years, it will be altogether impossible. Therefore even a partial record of the aspect and distribution of the plants should be of value in all studies of succession and range of species in this part of the state. Though many botanists have collected over this area, it has not heretofore been treated as a unit. The present study was confined to the perennial plants and those obtainable in the late summer of 1931 and in the spring of 1932. The addition of a catalogue of the summer-blooming plants is necessary to complete this study.

DESCRIPTION OF THE AREA

The Redwood Peak area consists of a single ridge lying just to the northeast of the city of Oakland—in Brooklyn Township of Alameda County, only a short distance from the Contra Costa County line. The ridge, which is approximately two and a half miles long by three-fourths of a mile broad, extends from northwest to southeast. This rectangular area is cut off from the ridges adjacent to it upon all sides by the various ramifications of Redwood Creek, save only on the southwest corner, where a shallow, dry ravine completes this separation. The

¹ Contribution No. 51 from the Botany Department of the State College of Washington.

highest elevation is found near the western end of the ridge, where Redwood Peak proper attains a height of 1608 feet. From the narrow peak the summit of the ridge descends irregularly but gently to a height of 1100 feet on its eastern summit. The top of the hill, except for the peak itself, is rather broad, but falls off abruptly on either side to the stream-floor, whose lowest elevation is about 800 feet. Across the main branch of Redwood Creek to the north, this ridge is paralleled by two similar ones: Palo Colorado Ridge, lying partly in Alameda County and partly in Contra Costa County, and Moraga Ridge, lying wholly in Contra Costa. The western end of the San Leandro Hills abuts upon the eastern end and part of the southeastern border of Redwood Ridge. On the south side of the rectangle, across another branch of Redwood Creek and the shallow ravine at its western end stretches a series of hills of lower elevation which descend gradually to the edge of Fruitvale, Piedmont, and Oakland. Finally, the western boundary is marked by another irregular group of the Oakland Hills.

Redwood Ridge is a part of the Berkeley Hills Block of the Mount Diablo Range. The exposed rock of the hill is entirely of the Cretaceous age, of both the Lower and Upper periods of deposition. Most of the area is made up of sandstone—with some shales, belonging to the upper Chico formation. At Redwood Peak, the sandstones and shales have a thickness of two thousand to five thousand feet. On the southern edge of the block, this formation is replaced by the Oakland conglomerate, also of the Chico formation, which is approximately 1000 feet deep at Redwood Peak. From the outcrops in the adjacent hills, it is possible to construct a geologic column of the series which probably underlie the exposed rocks, and also those which once capped it but have since been removed. The basement rock is doubtless the same as that of the Sierra Nevada and Coast Ranges: granite or quartz diorite, apparently of post-Jurassic age. Upon this we should expect to find the characteristic Franciscan sandstones, cherts and limestones, intermixed with basalts and peridotite, which, in the hills to the south, have become serpentinized wherever exposed. This series, which is one of the most extensive sedimentary groups of the Bay Region, is probably of the Lower Cretaceous age. Immediately underlying the exposed Cretaceous rocks occur the carbonaceous shales of the Knoxville (Lower Cretaceous). If we judge by the structure of the higher hills immediately to the north, it seems quite likely that deposits of the Miocene age (Monterey Series) and of the Pliocene (Orinda forma-

tion) were laid down upon the Cretaceous materials but were subsequently eroded. This region has been the scene of much folding and faulting—especially at the close of the Tertiary Epoch—which have resulted in the tilting of the horizontal beds of Oakland conglomerate to an almost vertical plane, and in the warping and bending of the sandstone and shale beds.

The Chico rocks yield upon erosion a very coarse sedimentary soil of a light brown color. Upon the summit of most of the ridge and upon the treeless sectors of the south side, this soil forms but a thin layer over the underlying sandstones and conglomerates, which are frequently exposed. Wherever the Redwood forest still retains a foothold, as upon most of Redwood Peak and the northwestern end of the ridge, a considerable depth of humus has been accumulated. The soil which is not held fast by the roots of various types of plants is washed down to the creek bed in great quantities during every heavy rain.

At the Chabot Observatory, situated at an elevation of three hundred feet in the San Leandro Hills less than a mile east of the area in question, the annual recorded rainfall is 23.44 inches. During the summer months (June, July, and August) the precipitation is about one-third of an inch, but during the months of December, January, and February it is 12.85 inches. The coarse soil of the summit of the hill is incapable of absorbing much of this moisture, and it is quickly drained off. Redwood Ridge is high enough to be relatively free from the low fogs, but is completely covered by the high fogs, which reproduce conditions of moisture and humidity remarkably similar to those found in the Redwood belt of the Northern Coast. As recorded at Chabot Observatory, the mean temperature for this part of the hills over a number of years has been 56.3 degrees Fahrenheit—the highest recorded temperature being 100 degrees, and the minimum, 29 degrees.

THE VEGETATION

No distinct altitudinal cleavage into vegetation zones is visible in the area. The north side shows more of the characters of the Humid Transition Life Zone, whereas the summit and south slope display many features of the Upper Sonoran. On the north side are such indicators of the Transition Zone as *Sequoia sempervirens*, *Arbutus Menziesii*, *Ceanothus thyrsiflorus*, *Aralia californica*, *Corylus rostrata californica*, and *Physocarpus capitatus*. *Vaccinium ovatum* occurs not only

in the Redwood stand but also in the hard chaparral, as well as in the border forest and soft chaparral. *Cupressus macrocarpa* and *Pinus radiata*, normally found in the Transition Zone at Monterey, have been introduced and seem to thrive on the summit of the ridge, to the south-east of the main peak. On the other hand, such indicators of the Upper Sonoran as *Quercus agrifolia*, *Aesculus californica*, *Rhus diversiloba*, and *Artemisia californica* occur widely dispersed over the area, and *Adenostoma fasciculatum* forms a few dense stands on the summit. Thus it seems evident that such factors as the nature and the thickness of soil and the intensity of grazing play a more determinative rôle in the distribution of the various plant communities than do temperature and moisture, expressed in altitude.

ARBOREAL ASSOCIATIONS

REDWOOD FOREST. The most interesting plant community to be found in the area is the stand of *Sequoia sempervirens*, which covers the summit of the main peak and occupies most of the northwestern slope of the ridge. To the east, the growth becomes more and more scattered, being confined to patches along the main branch of the creek and to the various deep ravines on the north slope of the ridge. On the summit are a few scattered clumps of stunted Redwood, and a few larger groups in the gullies on the south side, but the tree is entirely absent from most of the southeastern border of the rectangle. The components of this association do not include nearly all those species normally occurring in the typical Redwood forests of the Northern Coast. In the first place, *Sequoia sempervirens* is the sole gymnospermous tree in this community on Redwood Ridge which appears to be native to it. There are none of the Redwood's usual coniferous associates, such as *Pseudotsuga taxifolia*, *Abies grandis*, *Tsuga heterophylla*, *Torreya californica*, *Picea sitchensis*, or *Taxus brevifolia*. Likewise, the following are lacking: in the broad-leaf understory, *Lithocarpus densiflorus*, *Quercus Kelloggii*, and *Q. Garryana*; of the shrubs, *Rhododendron californicum*; and such typical herbaceous associates as *Achlys triphylla*, *Claytonia sibirica*, *Mimulus dentatus*, *Oxalis oregana*, *Tiarella unifoliata*, and *Vancouveria parviflora*. The most complete expression of the association within our limits is to be found in Redwood Canyon, northwest of the principal peak, and upon the peak itself. In a few places we find an almost pure stand of *Sequoia sempervirens*, with a low understory of *Vaccinium ovatum*, and a ground cover of the ferns,

Polystichum munitum and *Dryopteris arguta*. Upon Redwood Peak the first understory includes *Umbellularia californica*, *Arbutus Menziesii*, and *Myrica californica*; and the shrubby understory contains *Vaccinium ovatum*, *Gaultheria shallon*, *Rosa gymnocarpa*, *Corylus rostrata californica*, *Ribes sanguineum glutinosum*, *Ceanothus thyrsiflorus*, *Rubus vitifolius* and *Lonicera hispidula californica*. As a ground cover occur such plants as *Polystichum munitum*, *Dryopteris arguta*, *Trientalis europaea latifolia*, *Asarum caudatum*, *Heuchera micrantha*, *Micromeria Chamissonis*, and *Viola sarmentosa*, and, in very shady, moist places, *Aralia californica* and *Athyrium Filix-foemina*. In the deep canyons, *Arbutus Menziesii* usually retreats to the border forest and *Umbellularia californica* becomes increasingly prominent, occasionally entirely replacing the Redwood and forming a pure consociation along the creek. Where the Redwood occurs as scattered clumps or individual trees as islands within other ecological groups, all semblances of its normal associations are lacking, although Madrone and California Bay are frequently found with it.

BORDER FOREST. Between the Redwood association and the brushy vegetation occurs a wide band of sclerophyllous dicotyledonous trees, associated with an understory of numerous species of shrubs. The dominant trees in this are *Quercus agrifolia*, *Arbutus Menziesii* and *Umbellularia californica*, and, very rarely, *Aesculus californica*. Among the shrubs most commonly growing with these tree-dominants are *Corylus rostrata californica*, *Physocarpus capitatus*, *Rubus parviflorus*, *R. vitifolius*, *Ceanothus thyrsiflorus*, *Sambucus caerulea*, *Rhus diversiloba*, *Symphoricarpos albus*, *Holodiscus discolor*, *Rhamnus californica*, *Osmaronia cerasiformis*, *Ribes sanguineum glutinosum*, *R. Menziesii leptosmum*, *Baccharis pilularis*, *Artemisia californica*, *Photinia arbutifolia*, *Diplacus aurantiacus* and *Lonicera hispidula californica*. *Pteridium aquilinum pubescens*, *Polystichum munitum*, and *Dryopteris arguta*, together with a changing population of annual herbs, compose the ground cover. On the north side of the ridge, this forest occupies the slopes between the Redwood-filled gullies, and occurs everywhere on the upper and lower margins of the Redwood association. On the south and east it is the principal forest cover, and here it merges by almost imperceptible degrees into the soft chaparral.

RIPARIAN ASSOCIATION. A distinct riparian association lines the banks of the forks and tributaries of Redwood Creek, and occurs to a lesser extent in some of the deeper moist gullies on all sides of the

ridge. The principal trees are *Alnus rhombifolia* and *Salix lasiolepis*, together with other trees and shrubs less constant in occurrence, including *Cornus californica*, *Lonicera involucrata Ledebourii*, *Physocarpus capitatus*, *Sambucus caerulea*, *Myrica californica*, *Symphoricarpos albus*, *Ribes sanguineum glutinosum*, and *Rubus vitifolius*. Along the eastern edge of the area, where this formation attains its greatest extent, *Aesculus californica* is generally a member of the group, and a few scattered trees of *Acer Negundo californica*, as well. The riparian association does not have any constant assemblage of herbaceous associates, but, because of their ecological requirements, various water-loving plants are to be found in it.

INTRODUCED TREES. The groves of *Eucalyptus globulus* and other related species, which have taken over such large parts of the Oakland Hills, have not (as yet) made any very considerable appearance in this particular area. Small patches do occur just to the east of the peak and at various spots on the periphery of the ridge. This tree forms almost pure stands, littering the ground with loose, resinous bark, until nothing can grow with it except a few weeds. Another introduced growth, although Californian in origin, is that of *Cupressus macrocarpa* and *Pinus radiata*, which has attained a remarkable development in the Oakland Hills, where the two species usually form dense mixed stands.

BRUSHY ASSOCIATIONS

SOFT CHAPARRAL. The soft chaparral is a very poorly defined ecological group, consisting of an extension of the shrubby understory of the border forest. It is impossible to draw a distinct boundary between the two, for the trees of the border forest frequently occur as islands in the chaparral, and all vacant spots in the forest are rapidly occupied by the shrubs. The soft chaparral is made up of very different assemblages of species, depending upon whether it is found on the south or the north side of the ridge. On the north side, it is constituted chiefly as follows: *Physocarpus capitatus*, *Symphoricarpos albus*, *Corylus rostrata californica*, *Rhus diversiloba*, *Holodiscus discolor*, *Ceanothus thyrsiflorus*, *Rhamnus californica*, *Osmaronia cerasiformis*, *Rubus vitifolius*, *Lonicera hispidula californica*, *Ribes sanguineum glutinosum*, and *R. Menziesii leptosmum*. On the south, the scrub occurs on thinner, drier soil; and the most common bushes, which are less mesophytic, are *Baccharis pilularis*, *Artemisia californica*, *Berberis pinnata*, *Photinia arbutifolia*, *Diplacus aurantiacus*, *Ribes divaricatum*, *Lupinus*

albifrons, *Rhus diversiloba*, *Rhamnus californica*, and *Rubus vitifolius*. Some patches contain various assortments of members of these two groups; hence it is most convenient to collect all under the term of "soft chaparral." Occurring as intruders into the chaparral are found *Arbutus Menziesii*, *Umbellularia californica*, and *Quercus agrifolia*, but the last frequently assumes its shrubby form (var. *frutescens*) and becomes an actual element of the association. A wide variety of herbaceous plants occurs in this brush, but especially common are *Pteridium aquilinum pubescens* and such hardy composites as *Baccharis Douglasii*, *Gnaphalium microcephalum*, *Aster radulinus*, and *Gutierrezia californica*. This scrub occurs especially on the south and east sides, and also on the edge of the border forest on the north side. Northeast of the peak there is an interesting expression of this assemblage, which is characteristic except for the decisive dominance of *Ceanothus thyrsiflorus* and the abundant occurrence of *Arctostaphylos Andersonii*.

HARD CHAPARRAL. Hard chaparral, the characteristic Californian "pygmy forest" of broad-leaved (for the most part), sclerophyllous shrubs, shows a very limited development on Redwood Ridge. It is confined to a few small areas on the summit, some distance to the east of the main peak. It is clearly separated from the soft chaparral, with the exception of the brushy growth to the northeast of Redwood Peak, where one of its most characteristic members, *Arctostaphylos*, occurs with species of the soft-leaved group. The dominant species of the society is *Adenostoma fasciculatum*, which occasionally forms closed stands but is usually accompanied by *Arctostaphylos Andersonii*, *A. glandulosa*, *Vaccinium ovatum*, and (of lesser importance) *Lotus scoparius*. These shrubs form an almost impenetrable growth, two to five feet high. Other species, notably *Rhus diversiloba*, *Photinia arbutifolia*, *Baccharis pilularis* and *Quercus agrifolia frutescens*, intrude from the soft chaparral and other groups. Almost no herbaceous species can exist under this dense cover, but *Sanicula Menziesii* and *Pedicularis densiflora* are exceptions to this rule. Of interest is the fact that a single tree of *Pinus attenuata* is growing in a patch of hard chaparral, on the north side of the summit. The occurrence of this single specimen and the similarity of the composition of the brush make it appear possible that the whole community has been introduced from Moraga Ridge, where a Knob-cone Pine forest grows together with a more complete expression of hard chaparral.

BACCHARIS CONSOCIATION. Between the soft chaparral and the areas devoid of any considerable perennial growth, occurs a wide band of *Baccharis pilularis*, usually in its erect form. Near the other brush, this growth is dense and represents an almost pure consociation, but becomes more and more scattered as it extends toward the herbaceous areas.

HERBACEOUS AREAS

Years of over-grazing and recurrent fire have obliterated any natural herbaceous formations which may once have existed here. Now the herbaceous areas are merely those tracts which do not possess as cover one or more of the plant groups mentioned above. These areas are chiefly on the summit of the eastern portion of the ridge and on much of the south side, as well as patch-wise among the other communities. Usually this type of vegetation is situated upon a soil too thin to support any taller dominants, and the spaces it occupies serve as a setting for a rapidly shifting display of annual and biennial plants. Some of the most common native species are the following: *Eriogonum nudum*, *Epilobium paniculatum*, *Eschscholtzia californica*, *Solidago californica*, *Eriophyllum confertiflorum*, *Gnaphalium microcephalum*, *Zauschneria californica*, *Wyethia angustifolia*, *W. helenioides*, *Chlorogalum pomeridianum*, *Oenothera ovata*, *Brodiaea capitata*, *Luzula campestris*, *Festuca megalura*, *Stipa pulchra*, *Sisyrinchium bellum*, *Calandrina caulescens*, *Lepidium nitidum*, *Acaena pinnatifida californica*, *Sidalcea malvaeflora*, *Viola pedunculata*, *Sanicula bipinnatifida*, *Cogswellia utriculata*, *C. dasycarpa*, *Dodecatheon Hendersonii cruciatum*, *Monardella villosa*, *Orthocarpus pusillus*, *Filago californica*, *Trifolium amplexens*, and so forth. *Pteridium aquilinum pubescens*, *Baccharis pilularis* and *Rubus vitifolius* frequently intrude. Many alien weeds have found this environment favorable and have almost superseded the native herbs in a number of instances, where over-grazing has worked to their advantage. Some of the most wide-spread of these intruders are *Poa annua*, *Avena barbata*, *Rumex pulcher*, *Chenopodium album*, *Rumex acetosella*, *Raphanus sativus*, *Brassica campestris*, *B. adpressa*, *Barbarea vulgaris*, *Verbena prostrata*, *Sherardia arvensis*, *Hypochaeris radicata*, *Lactuca scariola*, *L. canadensis*, *Sonchus asper*, *Anthemis Cotula*, *Cirsium lanceolatum*, *Silybum marianum*, *Centaurea melitensis*, *Capsella Bursa-pastoris*, *Medicago hispida*, *Oxalis corniculata*, *Erodium botrys*, *E. cicutarium*, *Anagallis arvensis*, and *Taraxacum vulgare*.

COMPARISON WITH ADJACENT AREAS

SEQUOIA PARK. Sequoia Park, which touches Redwood Ridge on the southwest, exhibits Redwood and border forest, soft chaparral, *Baccharis*, and herbaceous areas similar to those of the range in question. But for the greater part, these native associations have been superseded by dense stands of Monterey Pine and Cypress.

SAN LEANDRO HILLS. On the adjacent north and west slopes of the San Leandro Hills, the main cover is *Quercus-Arbutus* forest with patches of soft chaparral, containing *Vaccinium ovatum*, *Arctostaphylos Andersonii*, and *A. glandulosa*. Near Redwood Creek in sheltered gullies are extensive fragments of Redwood forest. The summits are bare, herbaceous areas, bordered with Coyote-brush, as the result of continued grazing.

PALO COLORADO RIDGE. Palo Colorado Ridge lies directly north of Redwood Ridge, paralleling and separating it and Moraga Ridge. The dominant vegetation of the south side is *Arbutus-Quercus* forest with the same brushy associates as on Redwood Ridge. Above, the forest passes into brush, to *Baccharis* consociation and finally ends in bare, herbaceous tracts. Toward the east, these last increase greatly in extent, whereas the woody associations dwindle in proportion. The Redwood occupies the shaded gullies of the north side and is almost missing from all other parts of the ridge, whereas the border forest holds the ridges. One small patch of hard chaparral—composed of *Adenostoma fasciculatum*, Scrub-oak, and the two Manzanitas, closely surrounded by *Baccharis*—occurs on the south side near the summit. Above Eastport Station, to the west of Redwood Ridge, a north hill slope is covered with a dense brush including the following shrubs: *Arctostaphylos Andersonii*, *A. glandulosa*, *Garrya elliptica*, *Vaccinium ovatum*, *Ceanothus sorediatus*, *Castanopsis chrysophylla minor*, *Dirca occidentalis*, *Lotus scoparius*, and *Diplacus aurantiacus*. The canyon between Moraga and Palo Colorado Ridges (New Redwood Canyon), through which runs the Sacramento and Northern Railway, possesses a dense stand of *Sequoia sempervirens*, which gives way on the east and the west to a typical riparian associes.

MORAGA RIDGE. The lower levels of the south side of the ridge are occupied by border forest, Redwood (except in a peculiar shrubby form) being almost absent except at the west end of the ridge. The summit has a coarse, gravelly soil of light tuffaceous material, which supports a dense cover of hard chaparral intermixed with a forest of

Pinus attenuata. The principal members of the chaparral are *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *A. Andersonii*, *Ceanothus sorediatus*, *Quercus agrifolia frutescens*, *Q. Wislizenii frutescens*, *Pickeringia montana*, *Castanopsis chrysophylla minor*, *Vaccinium ovatum*, *Dendromecon rigida*, and *Lotus scoparius*. *Photinia arbutifolia*, *Diplacus aurantiacus*, and scrubby individuals of Madrone are also present. The growth of Knob-cone Pine is not continuous, but occurs throughout the other scrub in scattered patches of various size or as individual trees. The pines are of small size, usually from eight to twenty-five feet high, producing an abundant crop of cones.

ALTERATION OF THE FLORA; PLANT SUCCESSION

The remarks of this section have been withheld until this point because they seem to apply to the adjacent areas just mentioned as well as to Redwood Peak. During the Spanish occupation of this region, the hills were used for the grazing of large herds, and the summit of Redwood Ridge has been almost continuously pastured from that time until this day. The large stand of *Sequoia*—occupying much of the ridge and probably also parts of Palo Colorado and Moraga Ridges, the northwest slope of San Leandro Hills, and Sequoia Park—was not seriously disturbed until the coming of the Americans. In 1849 the first sawmill was erected somewhere in this region, to be followed by five or six others within the next decade, and the original forest was soon so completely removed that only large stumps attest the immense size of the early trees. Hence the stand of Redwood occurring here today is chiefly second-growth, the small trees having arisen from the older stumps as crown-sprouts. We have no complete record of how great an extent the Redwood once occupied; but that it did once cover most of Redwood Ridge can hardly be doubted, and it is possible that it dominated even those barest areas whose topsoil was lost subsequently to the cutting of the forest. The chief evidence for postulating a formerly wider distribution of this association is furnished by the wide occurrence of scattered groups of Redwood forest and the distribution of *Vaccinium ovatum* and *Ceanothus thyrsiflorus*, which are normally associated with it. Redwood occurs in gullies on the north and south sides of Redwood Ridge, on the north and west sides of the western extension of the San Leandro Hills, on the north and south sides of Palo Colorado Ridge, at the west end of Moraga Ridge, and at various places in Sequoia Park. It seems to me that

such a discontinuous distribution can most readily be explained if these patches be regarded as remnants of a once continuous forest. The Huckleberry occurs in the hard chaparral on Redwood Ridge, Palo Colorado Ridge, and Moraga Ridge, and also in the soft chaparral and border forest on all these areas and in the San Leandro Hills. *Vaccinium ovatum* has been associated with the *Sequoia* forests since Pleistocene time and thrives especially well in the most dense stands. It does not seem likely that it would migrate into a formation which has to endure the maximum of illumination and exposure, but it does seem highly probable that it is a remnant of the original Redwood cover. When this was cut down, much of the soil was carried away by run-off, and the elements of the hard chaparral, soft chaparral, and border forest gained a foothold there but were unable to crowd out the Huckleberry which still remains with them. The California Lilac is not so widely distributed as the Huckleberry, but has been dispersed freely from the Redwood association out into the border forest and the soft chaparral. Wherever the present Redwood forest is removed by fire (cutting is now prohibited), the area it once covered is rapidly taken over by soft chaparral, intermixed with *Arctostaphylos Andersonii* and *Baccharis pilularis*, or, if the soil is rich in humus, by the border forest. It seems probable that this is exactly what took place after the logging-off of the ridge, and that the border forest, soft chaparral, hard chaparral, and even the herbaceous areas are now occupying tracts which once owned the undisputed sway of the Redwood assemblage.

In terms of modern ecology, the Redwood forest appears to be post-climax, at least over most of the area, and is unable to re-establish itself save vegetatively. The present climax seems to be the broad-leaved, sclerophyllous *Quercus-Arbutus* forest, which usurps control from *Sequoia* whenever this dominant is destroyed. On the thin-soiled summit, the xerophytic hard chaparral is perhaps climactic, whereas the soft chaparral represents a complex of seral phyads intermediate to either of these climaxes. The riparian elements, following the normal development of a hydrosere, will also give way to the less hydrophytic Oak-Madrone association. The herbaceous areas and the *Baccharis* consociation are sub-climaxes, artificially maintained by overgrazing. There seems little doubt that the Oakland Hills have suffered a climatic shift toward greater aridity, and that this has prevented the man-destroyed original vegetation from regaining dominancy.

CATALOGUE OF INDIGENOUS SPECIES

Gymnogramma triangularis Kaulf., *Polypodium vulgare* L. vars. *occidentale* Hook. and *intermedium* (H. & A.) Fernald, *Adiantum Jordanii* Mull., *Pteridium aquilinum pubescens* Underw., *Pellaea andromedaefolia* Fee, *Woodwardia radicans* Sm., *Polystichum munitum* Presl, *Dryopteris arguta* (Kaulf.) Wats., *Athyrium Filix-foemina* (L.) Roth, *Equisetum telmateia* Ehrh. var. *Braunii* Milde., *Pinus attenuata* Lemmon, *Sequoia sempervirens* (Lamb.) Endl., *Festuca megalaria* Nutt., *Melica bulbosa* Geyer, *Stipa pulchra* Hitchc., *Carex barbarae* Dewey, *Juncus balticus* Willd., *Luzula campestris* DC., *Zygadenus Fremontii* Wats., *Chlorogalum pomeridianum* (Ker.) Kunth, *Brodiaea capitata* Benth., *Calochortus luteus* Dougl., *C. umbellatus* Wood, *Fritillaria lanceolata* Pursh, *Disporium Hookeri* (Torr.) Britt., *Smilacina sessilifolia* Nutt., *S. racemosa* L., *Trillium sessile* L. var. *giganteum* H. & A., *T. ovatum* Pursh, *Sisyrinchium bellum* Wats., *Salix lasiolepis* Benth., *Alnus rhombifolia* Nutt., *Corylus rostrata* Ait. var. *californica* A. DC., *Quercus agrifolia* Nee and var. *frutescens* Jepson, *Myrica californica* Cham., *Urtica gracilis* Ait. var. *holosericea* (Nutt.) Jepson, *Asarum caudatum* Lindl., *Pterostegia drymarioides* F. & M., *Eriogonum vimineum* Dougl. var. *caninum* Greene, *E. nudum* Dougl., *Calandrina caulescens* H.B.K., *Claytonia perfoliata* Donn, *Sagina occidentalis* Wats., *Actaea spicata* L. var. *arguta* Torr., *Delphinium decorum* F. & M., *Thalictrum polycarpum* Wats., *Ranunculus californicus* Benth., *Clematis ligusticifolia* Nutt., *Berberis pinnata* Lag., *Umbellularia californica* Nutt., *Eschscholtzia californica* Cham., *Thelypodium lasiophyllum* (H. & A.) Greene, *Cardamine oligosperma* Nutt., *Dentaria integrifolia* Nutt., *Arabis glabra* (L.) Bernh., *Tropidocarpum gracile* Hook., *Lepidium nitidum* Nutt., *Thysanocarpus curvipes* Hook., *Tillaea erecta* H. & A., *Saxifraga virginensis* Michx., *Lithophragma affinis* Gray, *Heuchera micrantha* Dougl., *Ribes sanguineum* Pursh var. *glutinosum* Loud., *R. divaricatum* Dougl., *R. Menziesii* Pursh var. *leptosmum* Jepson, *Physocarpus capitatus* (Pursh) Ktze., *Holodiscus discolor* (Pursh) Maxim., *Rubus parviflorus* Nutt., *R. vitifolius* C. and S., *Fragaria californica* C. & S., *Rosa gymnocarpa* Nutt., *Acaena pinnatifida* R. & P. var. *californica* Jepson, *Adenostoma fasciculatum* H. & A., *Osmaronia cerasiformis* (T. & G.) Greene, *Photinia arbutifolia* Lindl., *Lupinus latifolius* Agardh, *L. bicolor* Lindl., *L. albifrons* Benth., *Trifolium amplexans* T. & G., *Lotus scoparius* (Nutt.) Otteley, *Psoralea physodes* Dougl., *Vicia americana* Muhl. and var. *linearis* Wats., *V. gigantea* Hook., *Lathyrus vestitus* Nutt., *Rhus diversiloba* T. & G., *Acer Negundo* L. var. *californicum* Sarg., *Aesculus californica* (Spach) Nutt., *Rhamnus californica* Esch., *Ceanothus thyrsiflorus* Esch., *Sidalcea malvaeflora* Gray, *Viola sarmentosa* Dougl., *V. pedunculata* T. & G., *V. adunca* Sm., *Echinocystis fabacea* Naud., *Zauschneria californica* Presl, *Epilobium paniculatum* Nutt., *Godetia Bottae* Spach, *Oenothera ovata* Nutt., *Aralia californica* Wats., *Sanicula Menziesii* H. & A., *S. bipinnatifida* Dougl., *Conium maculatum* L., *Heracleum lanatum* Michx., *Cogswellia utriculata* (Nutt.) Jones, *C. dasycarpa* (T. & G.) Jones, *Cornus californica* C. A. Mey., *Gaultheria shallon* Pursh, *Arbutus Menziesii* Pursh, *Arctostaphylos glandulosa* Eastw., *A. Andersonii* Gray, *Vaccinium ovatum* Pursh, *Dodecatheon Hendersonii* Gray var. *cruciatum* Greene, *Trientalis europaea* L. var. *latifolia* Torr., *Gilia multicaulis* Benth., *Nemophila heterophylla* F. & M., *Phacelia californica* Cham., *P. distans* Benth., *Cynoglossum grande* Dougl., *Amsinckia Douglasiana* DC., *Plagiobothrys nothofulvus* Gray, *Micromeria Chamissonis* (Benth.) Greene, *Stachys ajugoides* Benth., *Monardella villosa* Benth., *Solanum umbelliferum* Esch., *Scrophularia californica* Cham., *Diplacus aurantiacus* (Curtis) Jepson, *Mimulus Douglasii* Gray, *M. guttatus* DC.,

Castilleja parviflora Bong. var. *Douglasii* (Benth.) Jepson, *C. foliolosa* H. & A., *Orthocarpus pusillus* Benth., *O. densiflorus* Benth., *Pedicularis densiflora* Benth., *Plantago erecta* Morris, *Galium Nuttallii* Gray, *Sambucus caerulea* Raf., *Symphoricarpos albus* (L.) Blake, *Lonicera involucrata* Banks var. *Ledebourii* (Esch.) Jepson, *L. hispidula* Dougl. var. *californica* Jepson, *Stephanomeria virgata* Benth., *Gutierrezia californica* T. & G., *Grindelia robusta* Nutt. var. *patens* (Greene) Jepson, *Solidago californica* Nutt., *Chrysopsis villosa* Nutt. var. *Bolanderi* Gray, *Aster chilensis* Nees., *A. radulinus* Gray, *Baccharis pilularis* DC., *B. Douglasii* DC., *Filago californica* Nutt., *Psilocarphus brevissimus* Nutt., *Gnaphalium microcephalum* Nutt., *Wyethia angustifolia* Nutt., *W. helenioides* Nutt., *Hemizonia congesta* DC. var. *luzulaefolia* (DC.) Jepson, *Eriophyllum confertiflorum* (DC.) Gray, *Helenium puberulum* DC., *Achillea millefolium* L. var. *lanulosa* (Nutt.) Piper, *Artemisia californica* Less., *A. vulgaris* L. subsp. *heterophylla* (L.) H. & C., *Cirsium occidentale* (Nutt.) Jepson.

SALT TOLERANCE OF *RUPPIA MARITIMA* IN LAKES OF HIGH MAGNESIUM SULPHATE CONTENT¹

ELIZABETH M. MCKAY

A study was made of the seed-bearing plant *Ruppia maritima* growing in a lake containing a high content of magnesium sulphate, a compound toxic to most plants in any but very dilute concentrations, of the water in which the *Ruppia* was growing, and of water from nearby lakes of high salt content which did not support *Ruppia*. The lakes are located in north central Washington near the town of Oroville and in southern British Columbia. Collections were made from the lake supporting *Ruppia* in May, 1931, May, 1933, and July, 1933.

At the time of the first collection, the concentration of the lake water was about 26 per cent, the pH was 7.4, the specific gravity was 1.21 at 23° C., and the osmotic equivalent was 58.0387 atmospheres. *Ruppia* was abundant. There was a heavy growth of blue-green and green algae, and crustaceans (*Artemia salina*) were numerous. The banks of the lake were dry, crystalline, and white on top with black mud underlying. Collections were made of the water and of the mud. Upon drying, this mud appeared white and crystalline like the layer above.

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At the time of the second collection—May, 1933, after a rainy season—the concentration of the lake was about 1.6 per cent, the pH was 8.4, the specific gravity was 1.012 at 26° C., and the osmotic pressure was 3.797 atmospheres. *Ruppia* showed a heavy vegetative growth and was flowering. *Artemia* was abundant, but fewer algae were found than at other visits. The banks were gray and dull in appearance. Collections were made of water, of *Ruppia*, and of *Artemia*.

At the time of the third collection—July, 1933, after dry weather—the concentration was about 6 per cent, the pH was above 8.5, the specific gravity was 1.045 at 26° C., and the osmotic pressure was 12.28 atmospheres. Algae, *Artemia*, and seed-bearing *Ruppia* were abundant. The banks were white and crystalline in appearance. Collections were made of *Ruppia* and of water.

Collections of water were made at the other two lakes in July, 1933. The concentration of one lake was about 48 per cent, the pH was 7.28, the specific gravity was 1.380 at 26° C., and the osmotic pressure was about 125 atmospheres. The lake had been reduced by evaporation to many small, round pools with salt crystallized on top, and the lake bed was white and crystalline with black mud under the surface layer. The concentration of the other lake was about 2.4 per cent, the pH was above 8.5, the specific gravity was 1.020 at 26° C., and the osmotic pressure was 6.506 atmospheres.

Sap from plants of the May, 1933, collection showed a specific gravity of 1.020 at 26° C., and an osmotic pressure of 6.637 atmospheres; from the July, 1933, collection, a specific gravity of 1.025 at 26° C., and an osmotic pressure of 9.755 atmospheres.

Quantitative analysis was made of the sap and insoluble material of the plant collections as well as of each of the five water samples for the following: Mg, Na, K, Ca, Fe and Al, SO₄, Cl, PO₄, and NO₃. Analysis was made for NH₃ in the water samples. Of this compound, only traces were found. No traces of As could be found.

The results show 40 per cent of the total molar concentration of the salt in the lake supporting *Ruppia* to be due to Mg, 45 to 48 per cent to be due to SO₄, and 9 to 11 per cent to be due to Na. The pH is apparently not a factor in plant distribution in these lakes.

Ruppia is able to tolerate Mg and SO₄ in high concentrations internally as well as externally, evidently using these in developing its own osmotic pressure.

The limiting factor in the development of *Ruppia* in lakes not supporting it is apparently a greater proportion of Na_2SO_4 .

Cultures of *Artemia* and *Ruppia* indicate that MgCl_2 cannot replace MgSO_4 .

Time of flowering and seed development of *Ruppia* are apparently influenced by the concentration of the lake in which it grows.

In May, 1933, the solution in which *Ruppia* was growing had an osmotic pressure of 3.797 atmospheres as against an internal osmotic pressure of 6.637 atmospheres. In July, 1933, the osmotic pressure of the external solution was 12.28 atmospheres as against an internal pressure of 9.755 atmospheres.

THE FUNGOUS FLORA OF NORMAL APPLES¹

GLENN A. HUBER

Part I

THE SOURCES OF CONTAMINATION AND SPORE LOAD

Normal apples are first contaminated with fungous spores while in the orchard during the growing season. Contamination is chiefly through the spores produced in great abundance in the orchard and in the immediate vicinity. This was shown by the determination of the abundance and types of spores in the air in various orchards at harvest time. Determinations were made through the exposure of hardened two per cent dextrose potato agar plates and filtration of measured quantities of air. Tests made in 1929 and 1930 showed that in neglected orchards the number of spores produced and liberated was greater than in well-kept orchards. Genera of fungi most commonly present were *Cladosporium*, *Dematium*, *Mucor*, *Aspergillus*, and *Alternaria*. *Penicillium* was obtained least frequently.

Analyses of apples carefully picked from the trees and so handled as to prevent further contamination showed from 14,000 to 159,100 spores per apple. *Cladosporium*, *Dematium*, and *Alternaria* types were most abundant. *Penicillium* types were present on six of the eighteen apples analyzed, but were not very abundant, the most on any one apple being less than one per cent of the total spore count.

¹ Abstract of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Plant Pathology, State College of Washington (1931).

The effect of surface and overhead irrigation of orchards on the spore load of normal apples was determined through the careful examination of apples produced under each of these conditions. Apples from the surface-irrigated plot showed an average of 36,766 spores per apple, whereas those from the overhead irrigated plot showed an average of 119,616. Many more types of fungi, including *Penicillium*, were found on the apples from the surface irrigated plot. The great majority of fungous spores on apples from the irrigated plot were the white Dematium form (*D. pullulans*). This was due to its habit of reproduction on the surface of the apples. *Penicillium* types were absent.

"Dirty" picking boxes, especially those which have been used for several seasons, are a very important source of contamination of the normal apple after picking. Analyses of six boxes which were badly discolored and showed evidence of fungi revealed an average load of 108,050,160 spores of fungi on the interior surface. A box with the maximum contamination was carrying a load of 109,958,400 spores on the inner surface of the bottom boards only, of which 32,987,520 were *Penicillium* types, the majority being *P. expansum*.

Analysis of the air in ten packing houses during the packing season by both the exposure plate and filtration methods showed that a large number of fungous spores were present in the air, many of which were known to be capable of causing decay of apples in storage. The number of spores in the air depended largely upon the condition of the packing house. Where sanitary measures were applied in and around packing houses, spores in the air were much less numerous than in houses where sanitary measures were not practiced.

Various processes used for the removal of the arsenical residue from apples were tested to determine their effectiveness in reducing the spore load of packed apples which go into storage. These studies were made in 1926, 1927, and 1930. In 1926 dry-wiping processes were used. Analyses of apples thus treated showed little or no reduction in the spore load. In fact, some of the lots tested showed an increase in spore load. Blue mold (*P. expansum*) was much more prevalent in the treated lots than in the untreated. In 1927 both wet chemical and dry-wiping processes were used. These improved methods reduced the spore load to a certain extent but not enough to have an appreciable effect in the prevention of storage rots. In 1930 wet chemical processes were used entirely. Several lots of apples were analyzed which had

been cleaned by various processes—some by the acid process, others by the Laux process, and still others by the Brogdite-Brogdex process. All three methods greatly reduced the spore load of the apples. However, the solutions, both acid and alkali, had little or no effect on the types of fungi present.

Further analyses of apples cleaned by the Brogdite-Brogdex treatment were made to test the effectiveness of the Brogdite solution upon the removal of the fungous spores and to test the part played by the application of the Brogdex coating. The tests showed that the Brogdite solution removed some of the wax from the surface of the apples and with it removed many of the fungous spores. Other spores accumulated on the brushes with which the Brogdex was applied and these in turn were deposited on the surface of the apples when they were coated.

Analyses of gloves worn by sorters showed from 12,100 to 40,000 spores per square inch in the palms of the six gloves tested.

Part II

FUNGI PRESENT AND THEIR RELATION TO DECAY

The surfaces of normal apples obtained from four important apple-growing districts of Washington (Kennewick, Spokane, Yakima, and Wenatchee valleys) were analyzed to determine the fungi present. One hundred and twenty-four species or forms, belonging to twenty-nine genera—besides twenty-three unclassified, non-rot-producing forms—were isolated from the surface of normal apples. Fifty-eight of these species or forms were found to be capable of causing distinct decay when inoculated into sound ripe Jonathan apples, of which thirty-four were capable of causing decay when incubated at 0°-2° C.

Over twenty species belonging to fourteen genera were obtained which had not been previously recorded on apples in the state of Washington. The following fungi which have been found to be capable of causing decay of apples are reported for the first time: *Sporomia* sp., *Pyrenochaeta* sp., *Chaetomella* sp., *Aspergillus* sp., *Verticillium* sp. (Forms 1, 2, and 3), *Podosporiella* spp. (Nos. 1 and 2).

THE INHERITANCE OF RESISTANCE TO PHYSIOLOGIC
FORMS OF *TILLETIA LEVIS* AND *T. TRITICI*, AND
THE EFFECT OF TEMPERATURE ON
PATHOGENICITY¹

WILLIAM K. SMITH

In all the regions of the world in which wheat is an important crop, bunt is a destructive disease of that grain. The disease is caused by two species of fungi, *Tilletia levis* and *T. tritici*. Within these two species, in the last four years a number of physiologic forms have been discovered.

Previous genetic studies on the reaction of wheat hybrids to bunt have been conducted with only a single form or a collection of forms of *T. tritici*. Accordingly, an attempt was made to study the reaction of wheat hybrids to each of three physiologic forms of *T. tritici* and two forms of *T. levis*, which were isolated recently at the State College of Washington from collections made in the Pacific Northwest. The seeds obtained from each second-generation plant resulting from a cross between Hope, a variety of *Triticum vulgare* resistant to all five forms, and Jenkin, a variety of *T. compactum* susceptible to these forms, were divided into three parts; one part was inoculated with a form of *T. tritici*, a second with a form of *T. levis*, and the third with a mixture of the remaining three forms. The hybrids and the parents were planted in the spring. From correlations between the resultant percentages of bunt in the three series, together with the examination of the distribution of progenies within each series, it was concluded that the factors in the Hope variety for resistance to any one of the five physiologic forms are the same as those for resistance to any of the other four; and, further, that three main factors in Hope are responsible for this resistance.

A similar study was made of the reaction of fall-sown hybrids of Hope x White Odessa and Hope x Ridit to a physiologic form of *T. levis*. The data obtained in the Hope x Ridit cross indicate that Ridit carries a single main factor for reaction to this form.

¹ Abstract of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Agriculture (Agronomy), State College of Washington (1931). Published in part as "The Effect of Different Temperatures on the Reaction of Hope Wheat to Bunt," *Phytopathology*, XXII (1932), 615-27; "Inheritance of Wheat to Physiologic Forms of *Tilletia levis* and *T. tritici*," *Journal of Agricultural Research*, XLVII (1933), 89-105.

In these studies, there was no evidence of any relationship in inheritance between reaction to bunt and the characters, length of awn, color of glume, and winter or spring habit of growth.

Although Hope has been highly resistant to the five physiologic forms of bunt in all plantings made at the normal time for sowing spring wheats, it has been only slightly less susceptible than Jenkin to the same five forms when planted at weekly intervals during the fall. The greatest contrast between the environmental conditions prevailing in fall and spring sowings lies in the trend of temperatures subsequent to the emergence of the seedlings from the soil. Accordingly, attempts were made to determine the relationship between temperature and the reaction to bunt under controlled conditions in the greenhouse. It was found that Hope was resistant when grown at a relatively low temperature until emergence and then grown at a higher temperature, whereas plants grown continuously in the cool environment were highly susceptible. Jenkin was highly susceptible under conditions of both low and high temperatures. Therefore the different reactions exhibited by Hope in fall and in spring plantings seem to be due mainly to the respective temperatures subsequent to emergence of the seedlings from the soil.

The relative growth rates of Hope and Jenkin after emergence from the soil showed that the resistance of Hope at the higher temperatures cannot be due to a relatively greater speed of growth of the first green leaf or time of emergence of the spike from the leaf sheath.

NITROGEN IN RELATION TO COMPOSITION, GROWTH, AND YIELD OF WHEAT¹

L. D. DONEEN

The purpose of this study was to determine the effect of nitrogen fertilizer on the composition, metabolism, and growth of eight varieties of wheat grown under field conditions.

On soil containing sufficient quantities of available nitrogen for large yields of grain, the addition of sodium nitrate as a fertilizer

¹ Abstract of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Agriculture (Soils), State College of Washington (1933). Published by the Wash. Agr. Exp. Sta. in condensed form as Bul. 296 (Tech. Paper) (May, 1934).

caused a retardation of growth during the vegetative period of the plant and did not materially increase the yield or nitrogen content of the grain.

When limited quantities of available nitrogen were present in the soil, the addition of nitrogen fertilizer stimulated plant growth and caused an increase in the yield and nitrogen content of the grain.

The carbohydrate-nitrogen relationship in the plant tissue was not affected by the fertilizer treatments or by varietal characteristics of the wheat during the growing season under conditions of high or low nitrogen fertility of the soil.

Applications of sodium nitrate to soil that was low in available nitrogen caused an increase in total nitrogen and soluble non-coagulable nitrogen of the wheat plant during the vegetative stage. The nitrate nitrogen content of the plant juice was temporarily increased immediately following the application of the fertilizer.

Under extreme environmental conditions, such as an excessive amount of available soil nitrogen or an insufficient amount of soil moisture for growing and maturing the wheat crop, varietal characteristics were displayed in that some varieties had a greater tendency to adapt themselves to these extreme conditions than others.

Under favorable edaphic conditions the varietal characteristics relative to yield and quality of the grain were largely overcome by the addition of nitrogen fertilizer after tillering had ceased, whereas under adverse conditions of soil fertility and moisture the same varietal characteristics played a prominent part.

The maximum amount of dry weight occurred and the maximum quantity of nitrogen was absorbed at the blooming stage of the wheats. A decrease in the amounts of dry weight and nitrogen in the aerial part of the plants took place between the blooming stage and maturity. In some cases the reduction amounted to 50 per cent of the respective totals at the blooming stage.

The loss in dry weight and nitrogen in the wheat plants was directly related to the lack of available soil moisture when sufficient available nitrogen was present in the soil to produce a large yield. The wheat grown on the plots with the smallest amount of moisture suffered the greatest loss from the above-ground parts of the plants.

The addition of nitrogen fertilizer after normal tillering had ceased caused the production of new tillers and greatly increased the yield of grain, without materially affecting the size of the kernels.

By the control of one factor, the available nitrogen content of the soil, it was possible to overcome, to a great extent, varietal characteristics of growth and yield of grain when the moisture supply of the soil was adequate at all times.

INVESTIGATIONS ON THE ETIOLOGY AND CONTROL OF THE BLUE-MOLD DECAY OF APPLES CAUSED BY *PENICILLIUM EXPANSUM* LINK¹

KENNETH F. BAKER

These studies were conducted from 1930 to 1934 in the Wenatchee and Yakima Valleys and the laboratories in Pullman, Washington, to determine the factors affecting lenticel infection of apples by *Penicillium expansum* in Washington and to investigate methods of prevention of the disease.

A survey indicated that there were orchards in the state whose apple crop showed severe lenticel infections by blue mold every year, and others which sustained only occasional losses. The amount of lenticel infection was found to be dependent upon a combination of favoring conditions; in order of decreasing importance these were: the number of susceptible lenticels per apple, the number of blue-mold spores on the fruit, and the operation of factors influencing infection (for example, volatile products of the fruit, exosmosis of nutrients through uncutinized lenticel cells, juice from decayed fruit, and the acid condition of the moisture on the surface).

varieties of the state was Jonathan, Delicious, and Winesap. The degree of penetration of methylene blue dye through lenticels and the number of lenticel infections resulting from coating the fruit with

¹ Abstract of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Plant Pathology, State College of Washington (1934). The material of the dissertation has been included in the following publications:

Kenneth F. Baker and F. D. Heald. An Investigation of Factors Affecting the Incidence of Lenticel Infection of Apples by *Penicillium expansum*. Wash. Agr. Exp. Sta. Bul. 298: 1-48. 1934.

_____ and _____. Investigations on Methods of Control of the Blue-mold decay of Apples. Wash. Agr. Exp. Sta. Bul. 304: 1-32. 1934.

The number of susceptible lenticels per apple was increased by delayed picking, by holding fruit in cold storage and subsequently washing it in heated solutions (43° - 49° C.), and by severe bruising. The amount of lenticel infection was decreased as a rule in harvested fruit held dry for a few days at orchard temperatures and was decreased in all cases by dry heat treatment (30° C.) for ten days. The decreasing order of susceptibility to lenticel infection in the principal decayed tissue were found to be potentially valuable indices of the susceptibility of a given lot of apples under commercial conditions.

Presumptive evidence indicated that the promotion of lenticel infection by contact with adjacent decayed apples was due to enzymatic action on the uncutinized cells of susceptible lenticels, as well as to stimulus of spore germination. Cold storage was found not to prevent infection of wounds or lenticels, but merely to retard the development of decay.

It had previously been shown that the packing house is the main source of fruit contamination by blue-mold spores and that the boxes, washing tank, and handling equipment of it are important sources of infection. The contamination increases greatly during the harvest season and can be kept at a low level only by disinfection. In the present investigation the application of sprays of sodium hypochlorite solution having about 0.4 per cent available chlorine was found to be effective in such disinfection of equipment. Copper sulphate was not sufficiently toxic to be suitable for this purpose.

The use of chemically treated wraps was ineffective in the control of blue-mold decay because of the limited contact with the fruit. Treatment of the fruit with sodium hypochlorite solutions of the above-mentioned strength for a period of one minute greatly reduced the spore load and the percentage of decay at punctures. The use of such a rinse following the usual washing treatment is recommended for fruit from orchards consistently suffering severe losses from blue-mold decay. It was non-injurious, and the flavor and appearance of the fruit were not impaired. Cultural and handling practices known to predispose fruit to lenticel infection should be avoided if possible, and sanitation should always be practiced in the orchard and packing house.

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RESEARCH STUDIES of the STATE COLLEGE OF WASHINGTON

VOLUME III

DECEMBER, 1935

NUMBER 2

PETRARCH AND THE PHYSICIANS¹

DON CAMERON ALLEN

Like most of the great figures of history, Petrarch has suffered from academic tradition. The tradition has insisted that, in spite of the breadth of his genius, his mind was without logical order and his spirit without an anchoring place. Critics have been very clever in illustrating the shifts in his opinions, in observing the "wavering spirit," in mapping the battlefields of body and soul, and in discussing the Petrarchan "compromises." As a result of this persistent tradition, it has been in only the most recent studies that any attempts have been made to weave these apparent fluctuations into an organic whole. The ancient point of view still dominates most of the studies devoted to Petrarch's attitude toward the sciences of his time.

Almost every biographer and critic of Petrarch has summarized in a few paragraphs the essential data of Petrarch's anti-scientific philosophy. We are told that Petrarch did not share the common admiration for Aristotle, that he hated Averroes and his disciples, and that he was a life-long scorner of physicians. So much is true, but it is also disjunctive, for all these factors can be fitted together to indicate that Petrarch's attitude was the product of logical thinking. By far the most recent and the most extensive treatment of Petrarch's attitude toward science is contained in Professor Lynn Thorndike's monumental treatise.² Unfortunately, Professor Thorndike falls in with the traditionalists and relies too much on the biography of Robinson and Rolfe³ rather than on the corpus of Petrarch's writings. He tells us, for instance, that Petrarch disliked physicians yet had some of them for friends; that he was opposed to magic yet was himself accused of it; that he inveighed against astrology yet seems to have given credence

¹ This study was prepared while the author was a fellow of the American Council of Learned Societies. Because of being abroad at present, he has been unable to read the proofs.—Edd.

² *History of Magic and Experimental Science* (New York: Columbia University Press, 1935), III, 220 ff.

³ James Robinson and Henry Rolfe, *Petrarch* (New York and London, 1899).

to some of its tenets.* Finally, he uses the old argument that Petrarch's opinion varied with his mood, the circumstances, and the person addressed.

This attitude is that of the old school which no longer possesses much authority, for these factors which have been hitherto treated as disjointed or isolated can be shown to be intrinsic parts of a psychological, if not a logical, system of thought.

Before a person attempts to mould the thought of Petrarch into some sort of Procrustean pattern, he must familiarize himself with the temper of the fourteenth century, and ask himself how much of this temper was part of Petrarch. In a letter to Boccaccio, Petrarch indicates that Dante was a friend of both his father and his grandfather.⁵ Such a fact strikes one with the force of lightning. There seems to be a century, not a generation, between Dante and the son of his friend and fellow exile. The student of Dante must also be a student of Saint Thomas and Albertus Magnus, who are accorded honorable places in the *Paradiso*:

"Questi, che m'è a destra più vicino,
Frate e maestro fummi; ed esso Alberto
E di Cologne, ed io Thomàs d'Aquino."

The student of Petrarch need hardly know that these great scholastics lived, for he will look in vain for their names in the corpus of Petrarch's writings. Not only are the names of the encyclopaedists wanting, but, more remarkable still, there is little trace of their influence. To realize the full import of this fact, one must recall that scholasticism was quickened by the discovery of the new Aristotle little more than a half century before Petrarch's birth; that both Thomas and Albert were flourishing in the third quarter of the thirteenth century; and that in the year of Petrarch's birth Duns Scotus migrated from Oxford to Paris. During the life-time of Petrarch scholasticism was the order of

⁴ Inasmuch as Professor Thorndike mentions Petrarch's own defense against the charge of magic, one does not need to enter into that. The attitude of Petrarch on astrology may be found in the *Epistolae rerum senilium*, I, 4, 5, 7; III, 1; VIII, 1. Literary references to astrology would be permitted even to a modern. Petrarch's fear of the grand climacteric is based on the support given this superstition by the classical authors whom he, as the first humanist, respected. His own feelings are certainly expressed in these lines: "sed terrorem minuire, non augere propositum est. Vix enim ulla pars aetatis ab adolescentia in senium erit, quae non aliquarum mortium illustrium rea sit. Ego igitur ista non metuo, illi fidens, qui me ignarum in hanc vitam induxit, etc." *Rer. sen.*, VIII, 1.

⁵ For a full discussion of this, see E. H. R. Tatham, *Francesco Petrarca* (London, 1926), I, 39 ff.

the day in both France and England, and its traces were to be found in every lecture hall and pulpit.

The failure of Petrarch to mention the names of Thomas, Albert, and Duns Scotus does not arise from an ignorance of their systems but from a rational contempt for the methods that they represented.⁶ His contempt for the scholastics, whom he regularly called "old boys" ("senes pueri")⁷, is best found in three letters written to his friend Thomas Messiana.⁸ In one of these letters he makes sport of these graybeards who are still playing childish games, still riding hobby-horses:

"Si enim dialecticae scholas, quod in eis pueri lusimus, senes relinquere nescimus, eodem iure, nec par impar ludere, nec arundine tremula equitare pudeat, nec rursum cunis infantilibus agitari."⁹

He relates how the scholastics scorn all who do not know Aristotle.¹⁰ They have told him that Aristotle's *Ethics* is essential to a virtuous life; and, as he is writing to one of the "contentiosa Pariseos," he says most aptly, "Quid enim commune habet Aristotelis Ethica cum Gal-lorum ignorantia?"¹¹ His commonest complaint against the scholastics, however, is that they are forever arguing to no purpose and are never anxious to determine the ultimate truth.¹²

Although reared in a scholastic environment and educated in schools that still trained according to syllogistic logic,¹³ Petrarch was one of the leaders in the anti-dialectic movement that was to fight on until Ramus delivered the *coup de grace*. When one realizes the importance of the schools in Petrarch's time, when one comprehends their power, one realizes that Petrarch was a man of extreme courage. The intellectual results of this attitude entitle Petrarch to the accolade of "the first modern man." More than this, the hatred of Petrarch for the

⁶ He was well aware of the farthest reach of scholasticism, the school of Ockham: "De rebus familiaribus," *Opera* (Basil, 1554), p. 644.

⁷ "Reb. fam.," *Opera*, p. 645; "Contra medicum quendam invectivatum," *Opera*, p. 1225.

⁸ "Reb. fam.," *Opera*, pp. 644-646, 649-650, 651.

⁹ "Reb. fam.," *Opera*, p. 645.

¹⁰ "De sui ipsius et multorum ignorantia," *Opera*, p. 1159.

¹¹ "Contra Galli calumnias," *Opera*, p. 1194.

¹² "Reb. fam.," *Opera*, p. 644.

¹³ In the twelfth dialogue of the "De remediis utriusque fortunae" Petrarch gives an excellent satire of the raising of a "stultus juvenis" to the doctor's grade in the current scholastic curriculum. He concludes his account with "Mira prorsus transformatio nec Nasonis cognita." The formula of the schools as well as their content and temper was obnoxious to him.

scholastics provides us with a pivot on which to balance the philosophic system of Petrarch and explain his attitude toward science.

The household god of the scholastics was the new Aristotle, and Petrarch's opinion of Aristotle not only is directly influenced by his attitude toward scholasticism but provides one with another step in determining the logic of his system. Petrarch's awe before the world of Greek thought and his efforts to learn the language of the Greeks are well known; and there are few places in his writings where this awe and reverence are more clearly shown than in his estimates of Aristotle. He continually differentiates between Aristotle and this Greek's disciples, writing in the "De ignorantia":

"Contra Aristotelem nihil, sed pro veritate aliquid, quam licet ignorans amo, et contra Aristotelicos, multa quotidie in singulis verbis Aristotelem inculcantes, solo sibi nomine cognitum, usque ad ipsius ut auguror audientiumque fastidium, et sermones eius contra rectos ad obliquum sensum temerarie detorquentes, nemo vero me amantior, nemo reverentior, illustrium virorum . . . " ¹⁴

In the "Rerum memorandarum," he speculates on whether the true text of Aristotle has been preserved; he wonders whether it has not been corrupted in translations, as Cicero said was sometimes the fate of translations from the Greek. He admits that he finds it difficult to reconcile the reputation of Aristotle among the ancients with the Aristotle of the scholastics:

"Ego autem curiosior sum quam necesse est, memor tamen, quia cum prae-scriptis aliisque claris et crebris testimoniis, Aristotelem non minus eloquentia, quam scientia copiosum, in libris tamen eius, qui ad nos venerunt, sane certa fides, eloquentiae vestigium nullum est . . . Saepe igitur de hac re cogitanti nil aliud occurrit, quam Aristotelicos libros trans ferentium vel pigritiam certe, vel invidiam, vel inscitiam, denique quocunque voces nomine vitium fuisse, cuius tam late contagia fluxerunt, ut iam spes remedii nulla sit." ¹⁵

In spite of his desire to think well of Aristotle, Petrarch could not help associating him with the scholastic methods; moreover, as he points out, the scholastics with whom he disputed were always quoting Aristotle to him. Petrarch was not, however, taken back by the weight of Aristotle's prestige; he tells of one occasion:

"Solebant illi, vel Aristotelicum problema, vel de animalibus aliquid in medium iactare, ego autem vel tacere, vel iocari vel ordini aliud, interdumque subridens

¹⁴ *Opera*, p. 1160; *vide* "Reb. fam.," *Opera*, p. 645.

¹⁵ *Opera*, p. 466. In the same treatise he wonders whether Averroes has corrupted Aristotle (*Opera*, p. 453). This is a remarkable utterance when one recalls that Dante had accorded to Averroes, "che 'l gran comento feo," an honorable place in the *Inferno*.

quaerere, quo nam modo id scire potuisset Aristoteles, cuius et ratio, nulla esset et experimentum impossibile."²⁸

But his personal knowledge of Aristotle and the patronage of that philosopher by the scholastics were not the only factors that alienated Petrarch. Petrarch was essentially a Platonist, although he was not able to read the manuscripts of the dialogues that he possessed. Besides having a natural Platonic cast of mind, Petrarch was impelled toward that school by the recommendations given it by Augustine and Cicero, the two writers of antiquity he respected most. In the "De ignorantia," he mentions the closeness of Platonism to Christianity and quotes the opinion of Augustine that, were Plato to return to this world, he would become a Christian convert.²⁹ In the "De contemptu mundi" are certain of the central Platonic, or better Neo-platonic, doctrines expressed by Augustine³⁰; and the similarity of these doctrines to Christian ideals is enough to indicate a possible reason for Petrarch's preference. Finally, Petrarch makes up his own balance sheet—a regular practice with him and a definite mediaeval trait; on the side of Plato are many of the noblest among the ancients, and on the side of Aristotle are the scholastics and that peddler of Aristotelian wares, Averroes:

"Et quis inquit principatum hunc Platoni tribuit, ut pro me respondeam, non ego, sed veritas ut aiunt. Et si non apprehensa, visa tamen illi propriusque adita, quam caeteris, dehinc magni tribuunt auctores, Cicero primum et Virgilius, non hic quidem nominando, sed sequendo, Plinius praeterea et Plotinus, Apuleius, Macrobius, Porphyrius, Censorinus, Iosephus, et ex nostris Ambrosius, Augustinus et Hieronymus, multique alii, quod facile probaretur, nisi omnibus notum esset. Et quis non tribuit nisi insanum et clamosum scholasticorum vulgus. Nam quod Averrois omnibus Aristotelem praefert, eo spectat, quod illius libros exponendos assumpserat et quodammodo suos fecerat, qui quanquam multa laude digni sint, suspectus tamen est laudator. Ad antiquum nempe proverbium res redit, Mercatores omnes suam mercem solitos laudare."³¹

Such is the case for the primacy of Plato.

Closely linked with Petrarch's scorn for scholasticism and his distrust of Aristotle is his hatred for Averroes and Arab learning. The fortunes of Averroes in the West are well known to those who have

²⁸ "De ignorantia," *Opera*, p. 1148.

²⁹ *Opera*, pp. 1162-1163. The opinion of Giuseppe Finzi on this point is worth citing: "Il Petrarca che per la tempera dell'ingegno, il gusto artistica, i principi ideologici del suo sapere filosofico, doveva tendere, quando mai, al platonismo . . ." (*Petrarca* [Firenze, 1900], p. 82).

³⁰ *Opera*, p. 390.

³¹ "De ignorantia," *Opera*, pp. 1160-1161.

followed the studies of Renan, De Wulf, De Vaux, O'Leary, Mandonnet, Wolfson, and others; it suffices to say that to the orthodox of the period he was a sort of Darwin. To Petrarch, who saw in him not only the possible despoiler of Aristotle but an enemy of Christian culture, the Arab was anathema. In a letter to his friend Marsili, Petrarch says that at one time he had intended to attack the doctrines of Averroes but had been hindered by many obstacles; he now urges his friend to write a polemic against "this rabid dog Averroes who driven mad by an infernal anger barks his blasphemy against Christ and the Church."²⁰ In another letter of grandfatherly advice to the son of a friend, he commands him to fight against Averroes, the "hostis" of all Christians and the "inimicus" of Christ.²¹ By this nice choice of nouns, he illustrates a definite attitude.

The *locus classicus* in the history of Petrarch's hatred of Averroes and the Averroists is the story that he relates to Boccaccio of the visit of one of the Averroists to his study. Petrarch cited some Scripture to his visitor, who immediately foamed at the mouth with rage, made fun of the little doctors of the church ("ecclesiae doctorculos"), and called Paul and Augustine prattlers. He urged Petrarch to read Averroes, for then he would see how much the Arab surpasses these hucksters of fiddlefaddle. The militant Christianity of Petrarch was aroused, and he confesses that he had to restrain himself from slapping the impious mouth of the blasphemer. Finally, he grasped the visitor by the cloak and put him out.²² This is one of the most graphic incidents in the whole body of Petrarch's self-revelations; and this hatred of Averroes blossomed into a hatred of Arabs in general.

Petrarch's opinion of Arabs and his impatience with the weight given to Arab authority by his contemporaries is clearly brought out in a letter to his physician friend, Giovanni of Padua. Basing his arguments upon Arab theory, the physician friend has recommended that Petrarch abstain from wine. Petrarch is greatly annoyed. He doesn't know much about the reputation of the Arabs in medicine, but he does know that the poets of Arabia are weak, enervating and evil. It is with difficulty that he persuades himself that anything good can come from Arabia. He is especially angered by a statement of Giovanni of Parma, who had said that only the Greeks and Arabs were capable of

²⁰ "Epistolarum sine titulo," *Opera*, p. 812.

²¹ "Epistolas rerum senilium," *Opera*, p. 1017.

²² "Rer. sen.," *Opera*, p. 880.

producing medical literature; and he refutes this *dictum* at great length. He concludes his remarks in a highly nationalistic manner:

"Denique Graecos et ingenio et stylo frequenter vicimus, et frequenter aequavimus immo si quid credimus Ciceroni, semper vicimus, ubi annisi sumus, quod si vere de nobis in comparationem omnium aliarum gentium dici potest Arabiculis, ut vos velle videmini, duntaxat exceptis, o infamis exceptio, ô vertigo rerum admirabilis, ô Italica vel sopita ingenia, vel extincta."²²

The basis for Petrarch's attitude toward the scientists, and especially the physicians, of his age is now established; it follows a track that is at once both logical and psychological. Spurning by nature the dryness, the contentiousness, and the intangibility of the scholastic system, he came to hate everything connected with it. He found it difficult to transfer this hatred to Aristotle, since Aristotle was a Greek and came to him with weighty commendations; however, being by nature a Platonist, Petrarch found it easier to take sides with a philosopher praised by Augustine and Cicero than with one lauded by the scholastics and Averroes. Averroes shared the fate of the scholastics; in fact, one may doubt that Petrarch made any distinction between them. Not only was the Arab the probable perverter of Aristotle, but his disciples were the enemies of Christ. As a result of this conclusion, Petrarch became an ardent opponent of Arab culture and all that sprang from it. These factors explain Petrarch's attitude toward the physicians, the largest scientific group of his time.

Petrarch was a persistent enemy of physicians from a very early period in his life until his death; his consistent hostility toward these scientists appears everywhere and culminates in the four books of the "*Contra medicum quendam invectivarum*."²³ When Boccaccio writes Petrarch that he had been ill but had recovered without medical aid,

²² "Rer. sen.," *Opera*, pp. 1009-1010.

²³ The genesis of this polemic is interesting. In 1352 Petrarch sent the ailing Clement a letter warning him against physicians, whom he styled a "crowd of enemies." This brought upon Petrarch the invective of a certain physician, and the hostility of the physicians of Avignon in general probably forced Petrarch to leave France. The nature of the attack upon Petrarch can be discerned from his own defense. They accused him of being ignorant of dialectic. "Dicis in primis me carere logica . . . Sed, o stulte, non hac careo, verum scio, quid ei, quid caeteris liberalibus artibus dandum sit. Didici a Philosophis, nullam earum valde suspicere. Equidem ut eas didicisse laudabile, sic in eisdem senescere puerile est. Via nempe sunt, non terminus, nisi errantibus ac vagis, quibus nullus est vitae portus . . ." (*Opera*, p. 1212). Then they accused him of being a poet and attacked poetry and poets in general. To the defense of poets and their works he devotes most of the third book. Finally they accused him of leading a life of solitude—a fact that he readily confesses and defends in the last book of the treatise.

Petrarch replies that there is no miracle in that since the shortest way to health is to keep the physician at a distance.²⁵ On another occasion he laments the dire necessity that forces one to employ the enemy physician against the enemy ill health.²⁶ The remarks might be those of a semi-invalid who had tried all remedies without avail, but the nature of medicine in Petrarch's time is well known, and as a consequence one discovers that his attacks on this science are simply part of his governing philosophy.

The medical profession of the fourteenth century was composed of two groups of practitioners. There were the physicians who followed syllogistic medicine and the Arabic theoric; they were usually well versed in the physical and biological writings of Aristotle, and they made up the majority of the Averroists. On the other hand were the surgeons who were considered on a level with artisans but whose purely mechanical methods brought occasional results. The medical schools of the time trained only physicians. There was no laboratory work of any kind and the course consisted mainly in the study of textbooks, among which the abridgment of the Arab Ibn Sina was a favorite. As an example of the type of medical theory taught in the schools, one might mention the argument about whether barley water was a specific for fever, in which the decision was negative, because barley water was "substantia," whereas fever was "accidens." This type of reasoning dominated the profession until well into the sixteenth century.²⁷

To Petrarch the physicians were simply scholastics, Aristotelians, and Averroists in another guise. In numerous instances he points out how, like the scholastics, they are forever arguing and never agreeing.²⁸

²⁵ "Rer. sen.," *Opera*, p. 881.

²⁶ *Ibid.*, p. 857 and p. 1039.

²⁷ See E. Bochart, *Histoire de la médecine et des theories medicales* (Paris, 1873); F. Puccinotti, *Storia della medicina* (Livorno, 1850); C. Daremberg, *Histoire des sciences medicales* (Paris, 1870); C. Sprengel, *Storia prammatica della medicina* (Venezia, 1842-45); G. Bilancioni, *La storia della medicina* (Rome, 1920); R. O. Moon, *The Relation of Medicine to Philosophy* (London, 1909); W. Puhlmann, *Die lateinische medizinische Literatur des frühen Mittelalters* (Leipzig, 1930); and C. Singer, *A Short History of Medicine* (Oxford, 1928).

²⁸ "Contra medicum," *Opera*, p. 1201. There is little doubt that Petrarch's chief attack is levelled against the syllogistic school which had ceased to follow the more sound principles of Galen and Hippocrates. "Credo ego Hippocratem virum doctissimum fuisse, puto Galienum (illo duce) multa primis inventionibus addidisse . . . Invenies me nil omnino contra Medicinam, nilque contra veros Medicos locutum, sed contra discerptores, atque adversarios Hippocratis . . ." (*Opera*, p. 1203).

When he debated with the papal physicians in France, they attacked poets in general since they were unable to find a weak spot in his armor. When he suggested that they ought to spare poor Virgil in their vendetta, they boasted, in true scholastic fashion, that they would attack whatever Petrarch professed. To this swashbuckling statement Petrarch affixes his judgment: "Ut liquido appareret, non veritatem illos quaerere, sed vindictam."²⁹ The physicians resemble the scholastics further in that they devote themselves to oratory and dialectic³⁰ and have a special predilection for the syllogism. "Olim quidem sine syllogismus curabantur."³¹ Besides this, they are fond of nomenclatures derived from the Greek and the Arabic, although they are unable to find Latin remedies.³² In keeping with their pomposity in speech, they dress in purple and wear fine rings. By means of these emblems, formerly the prerogatives of the nobility, they impress the vulgar while they practice on the credulity of the infirm, whom they slaughter without mercy and without incurring the normal penalty for murder.³³ After a patient dies they use all the powers of dialectic to show that it was the patient's fault and not theirs; but should he recover by natural means, they take all the praise for the cure.³⁴ Such are the physicians and how like they are to the scholastics.

In spite of his continual diatribes against the physicians, Petrarch regularly reminds his readers that he has no quarrel with medicine as an art or with the physicians who are untouched by scholastic chicanery. He loves medicine, which was created to be useful, but he hates those who have perverted it³⁵; he has intimate friends among the physicians,³⁶ and some of them are linked to him by similar tastes in letters.³⁷ He even writes to one of these friends, Giovanni of Padua, and urges him to take up the fight against these universal enemies who "rage, argue, and clamor" because Petrarch finds himself addressing only deaf ears in his attacks against them.³⁸ In the same epistle he gives his own concept of medicine. The definition is purely Platonic.

²⁹ "Rer. sen.," *Opera*, p. 1004. This point is reiterated in the first book of the "Contra medicum."

³⁰ "Rer. sen.," *Opera*, p. 1001 and p. 1053.

³¹ "Contra medicum," *Opera*, p. 1224.

³² "Rer. sen.," *Opera*, p. 885.

³³ *Ibid.*, pp. 881-882.

³⁴ *Ibid.*, p. 1001.

³⁵ "Rer. sen.," *Opera*, pp. 1002 and 1052; "Contra medicum," *Opera*, p. 1205.

³⁶ "Rer. sen.," *Opera*, p. 1053.

³⁷ *Ibid.*, p. 883.

³⁸ *Ibid.*, p. 1001.

Medicine exists "abstracto vel solius" in the mind of God and as such it is good for men, but the science is unknown to mortals and they have it, at best, only in its basest form.³⁹ This is a concept peculiar to Petrarch, and it goes a long way toward explaining his subsequent attitude toward the sciences. Finally, in one of his attacks on the physicians, one finds what appears to be the key to his anti-scientific philosophy.

"Vos habetis Aristotelem, cui de anima loqui concedendum, ut magistro Cicero ipse ait. Sed nec ille, nec vos aliud quaerere videmini, nisi quid sit anima, quaeve animae passiones, et diffinitionibus contentari iussam, cogitis esurire, toto nisu, circa hoc caducum et putre corpus incombitis, nobilissimum ut vos dicitis subiectum, quale autem vere quisque in se, nisi amens et sui oblitus intelligit, idque ipsum utinam bene fieret."⁴⁰

Here, then, is a major point; the scientist like Aristotle is busied primarily about material things, about the frail and putrid body, but what about the soul and its passions?

Petrarch's final philosophy is a spiritual one, and it is this which makes him hate the materialism of the physicians and the scientists. Man's study is man and man's soul. On this point he cites his master Augustine: "Et eunt homines admirari alta montium, et ingentes fluctus maris, et latissimos lapsus fluminum, et oceani ambitum et gyros syderum, et relinquunt seipsos."⁴¹ An equally telling section is to be found in the opening pages of the "De ignorantia": "Multa igitur de belluis, deque avibus ac piscibus, quot leo pilos in vertice, quot plumas accipiter in cauda, quot Polybus spiris naufragium liget." He goes on to list a great body of natural lore that stems from Aristotle and is repeated in all of the great encyclopaediae of the Middle Ages; and he is very shrewd in pointing out that many of these facts are to be learned only in distant lands or, as he says euphemistically, they happened at a distance from the narrator's eyes. But what good is it to know the nature of animals, of birds, fish, and serpents when "naturam hominum ad quid sumus, unde et quo pergimus vel nescire vel spernere."⁴² More important than the study of natural phenomena is what man is, whence he came, and whither he is going.

But can this lore be learned from philosophers, and can Aristotle teach it? In comparison with God who is Aristotle but a man who

³⁹ *Ibid.*, p. 1002; "Contra medicum," *Opera*, pp. 1202-1203.

⁴⁰ *Ibid.*, p. 1006.

⁴¹ "Reb. fam.," *Opera*, p. 695.

⁴² *Op. cit.*, p. 1144.

dwelt beneath the heavens?"⁴³ All philosophies and their teaching, Petrarch writes in a great summarizing paragraph, fail to decipher this mystery:

"Plato et Aristoteles magni viri, mundam faciunt aeternum, Democritus innumerabiles mundos facit, Epicurus Deum nullum et mortalem animam, hanc Pythagoras in gyrum ducit, sunt qui eam contrahant ad suum corpus, sunt qui eam spargant in corporibus animantum, sunt qui coelo reddant, sunt qui circa terras exulare cogant, sunt qui inferos asserant, sunt qui negent, sunt qui unam quam que per se, sunt qui simul animas creatas putent. Fuit et qui mirabilis quiddam dicere auderet, siquidem unitatem intellectus attulit dux vester Averrois . . ."⁴⁴

This, then, is the end of logic, of dialectic, of syllogistic reasoning, of dependence on the authority of philosophers: that one has naught but confusion. The way to truth, says Petrarch, is through God:

"At Tu Deus Meus scientiarum Domine, extra quem non est alius, quem et Aristoteli et Philosophis quibus libet ac Poetis ac quicunque multiplicant loqui sublimia gloriantes, quem denique literis et doctrinis et omnino rebus preferre omnibus debeo et volo."⁴⁵

This is the final goal of all knowledge, of "scientia" in the broader sense: to put aside all things for God. It is summed up by Petrarch in his great defense of himself: "Verus Philosophus est amator Dei."⁴⁶

The course of Petrarch's anti-scientific reactions is in keeping with the man and his temper. At the outset he finds himself opposed to his *milieu*. The scholastics weary him with their fruitless search for truth based on the authority of Aristotle and the tenets of Averroes. When he looks at the contemporary science of his day, he finds a similar situation. The physicians use all of the scholastic tricks; they depend on Aristotle and embrace the subtleties of Arab thought. Moreover, none of them are concerned with the great problems of what man is, whence he came, where he is going. Instead, they bother with material things, with man's vile body, with the breadth of rivers, with the manner in which the viper bears her young. In searching out the answers to the major problems of the spirit, all philosophers and philosophies have failed. God alone has the answer and man must look to God for it—not to the scientists.

⁴³ "De ignorantia," *Opera*, pp. 1152-1153, 1158.

⁴⁴ "Contra medicum," *Opera*, p. 1212.

⁴⁵ "De ignorantia," *Opera*, p. 1146.

⁴⁶ "Contra medicum," *Opera*, p. 1214.

SOME NOTES ON FIELDING'S PLAYS

EMMETT L. AVERY

I. *The Historical Register*

The date of the first performance of Fielding's *Historical Register*, which was presented in the New Theater in the Haymarket, has long been uncertain. Some years ago Professor C. W. Nichols, who had argued that the probable date was Monday, March 21, 1737, remarked that apparently "we shall never find the missing advertisements for the first performance of Fielding's *The Historical Register*."¹ Nevertheless, advertisements of the first performance of the play survive in the files of the *Daily Advertiser*,² and the advertisements prove that Mr. Nichols was correct in the date that he had proposed. In the *Daily Advertiser* for March 21, 1737, there appeared the following notice:

By the Great Mogul's Company of Comedians will be presented a Dramatick Piece call'd *The Historical Register*, for the Year 1736, with freshest Advices, Foreign and Domestick. Beginning with a Club of Politicians and ending with a Grand Dance of Patriots. Written by the Author of Pasquin.

Containing a Pack of Politicians; a Pack of Patriots; a Pack of Ladies; a Pack of Beaux; Mr. Medley, an Author; Mr. Sourwit, a learned Critick; Lord Dapper, a great Critick; Apollo's Bastard Son; Quidam Anglicae, a certain Person; Mr. Hen, an Auctioneer; Mr. Ground-Ivy, a Laureat; Mr. Pistol; Polly Smart; Polly Soft; Cum multis aliis quos nunc prescribere longum est.

N. B. All Persons are desir'd to cry at the Tragedy and laugh at the Comedy, being quite contrary to the present general Practice. Mr. Hen gives Notice, that if any Joke be both Hiss'd and Clapp'd, each Division will be consider'd as an Encore, and the said Joke be put up again.³

The play was repeated on the following nights to its eleventh performance (April 13), a presentation previously noted: Tuesday, March 22; Thursday, 24; Saturday, 26; Monday, 28; Tuesday, 29; Thursday,

¹ C. W. Nichols, "A New Note on Fielding's *Historical Register*," *MLN*, XXXVIII (1923), 507. See also his earlier article, "Fielding Notes," *MLN*, XXXIV (1919), 222, and my brief note in *MLN*, XLIX (1934), 407.

² Unless otherwise stated, the data given in this article are from the files of the *Daily Advertiser*. There is a long run of this newspaper in the Library of Congress, a file which has apparently been overlooked so far as Fielding and the New Theater are concerned. I expect shortly to publish some further material from this periodical concerning other aspects of the history of the New Theater and some dramatic pieces whose performance there or whose existence has hitherto escaped notice.

³ A news item in the *Daily Advertiser* for March 22 remarked: "Last night the two new Performances at the Hay-Market, viz., the Tragedy call'd *Fatal Curiosity*, and the *Historical Register*, were receiv'd with the greatest Applause ever shewn at the Theatre."

31; Saturday, April 1; Monday, 11; Tuesday, 12. The last performance recorded by Nicoll⁴ is for Thursday, May 5, 1737; to his list should be added performances on the following nights: Friday, May 6; Wednesday, 11; Thursday, 12; Tuesday, 17; Wednesday, 18; Thursday, 19; Monday, 23.

II. *Don Quixote in England*

Similarly, the exact date of the first performance of *Don Quixote in England* has remained unknown. Originally planned for production at Drury Lane probably in March, 1734, the play was crowded out in a theatrical quarrel of the moment; but, after a delay, it was presented in the New Theater in the Haymarket "by the middle of April," as W. L. Cross, following Genest, has pointed out.⁵ Professor Nicoll, indicating that it was given in April, 1734, adds, "No records of first performance."⁶

The first performance of this play was also advertised in the *Daily Advertiser*; according to it, the play was first acted on Friday, April 5, 1734, with the following advertisement:

Never acted before, By a Company of Comedians at the New Theatre in the Hay-Market, this Day the 5th of April, will be presented a New Comedy call'd Don Quixote in England. Written by the author of the Miser. To be perform'd by the Persons who rehears'd it in Drury-Lane before the Union of the Company. The play was repeated on the following nights: Monday, April 8; Tuesday, 9; Thursday, 11; Wednesday, 17; Thursday, 18; Friday, 19; Monday, 29. Sometime later, on August 19, 1734, it was revived with the following additions:

In which are introduc'd two Scenes representing Don Quixote as a Candidate for Member of Parliament, which contain the Humours of Mayors and Corporations. Written by Henry Fielding, Esq.

This version was given again on Wednesday, August 21.

III. *Covent Garden Tragedy*

It has been known that the *Covent Garden Tragedy* was given on some evenings as an afterpiece to *Don Quixote in England*,⁷ but the following performances are not recorded in Nicoll's Handlist: Wednesday, April 17, 1734; Thursday, 18; Friday, 19; Monday, 29. Later

⁴ Allardyce Nicoll, *A History of Early Eighteenth Century Drama* (Cambridge, 1929), p. 328.

⁵ *The History of Henry Fielding* (New Haven, 1918), I, 157; III, 298.

⁶ Nicoll, *op. cit.*, p. 327.

⁷ See Cross, *op. cit.*, I. 157.

it was given on May 27, and once in Lincoln's Inn Fields, on May 24, 1734, as an afterpiece to the *Beaux Stratagem*.

IV. *Eurydice Hiss'd*

Apparently *Eurydice Hiss'd*—or a play very much like it—had been intended for production on Monday, March 21, 1737, as a companion piece to the *Historical Register*, for a "very short and very merry Tragedy call'd The Damnation of Eurydice" was advertised but had to be deferred. As has been noted by both Cross and Nicoll, it was given first on April 13. To the performances listed in Nicoll, the following should be added: Friday, May 6; Monday, 9, Wednesday, 11; Thursday, 12; Monday, 23.

For the sake of completeness, there should be added some additional performances of four more of Fielding's plays. All of these were given in the New Theater in the Haymarket.

The Lottery: 1734: Friday, June 14; Wednesday, 19; Wednesday, 26; Monday, July 1; Wednesday, 10; Wednesday, 17; Monday, 29; Wednesday, 31.

The Miser: 1734: Wednesday, August 14.

The Mock Doctor: 1734: Wednesday, June 5; Monday, 17; Monday, August 5.

Pasquin: 1737: Friday, February 25; Saturday, March 19; Wednesday, May 4; Monday, May 9.

THE AUTHORSHIP OF "DIE ENGLISCHE SCHAUBUEHNE"

PAUL P. KIES

Contrary to current opinion, Lessing probably was the author of the biographical sketches of the second and the third periods in the "Geschichte der englischen Schaubühne," an article in the fourth number (1758) of his *Theatralische Bibliothek*. In the presentation of the data supporting this theory, I shall have occasion also to point out that the material of the sketches was derived from Theophilus Cibber's *Lives of the Poets of Great Britain and Ireland*, that Lessing's dramatic fragment *Fatime* (1759) was based upon No. 171 of Addison and Steele's *Spectator* as supplemented by the discussion of Fenton's *Mariamne* in the *Lives*, and that the German dramatist may well have been familiar with Marlowe's *Doctor Faustus*. These four conclusions are discussed together because they are closely related in respect to the evidence.

The biographical sketches, which comprise a little over half of "Die englische Schaubühne," are divided into three periods: first, from Shakespeare to the closing of the theaters in 1642; second, from the Restoration (1660) to the end of the seventeenth century; third, from the beginning of the eighteenth century to the time of the article (exclusive of the living dramatists). Immediately before the biographical sketches is a short introduction (twenty-two lines in the Deutsche National-Litteratur edition). The remainder of the article—about the first two-fifths—is a brief connected history of English drama before 1660 (or, more accurately, to about 1590 with a single paragraph on the period of Shakespeare). This running account (with some or all of the biographies of the first period), to be sure, is known to have been prepared by one of Lessing's intimate friends, Friedrich Nicolai. In a letter to Lessing dated August 31, 1756, Nicolai wrote:

Zum zweyten Stücke der Bibl. habe ich eine kurze Geschichte der englischen Schaubühne bis auf die Revolution unter Carl II. gemacht. Sie wissen, dass dazumahl die englische Schaubühne aus ihrem Grabe hervor stieg. Seit der Zeit, bis hieher, habe ich nicht genugsame Nachrichten zu einer zusammen hangenden Historie, sonderlich fehlt es mir an Nachrichten von den jetzt in England blühenden Schaubühnen. Wenn Sie nach England kommen, so werden Sie mich sehr verbinden, wenn Sie mich mit Materialien zu einer Fortsetzung meiner Geschichte versehen wollen. Wenn Sie sonderlich ein Buch finden, welches die

Geschichte der Schaubühne nach Carl II. bis hierher beschreibt, so senden Sie es mir; ich werde gern alle Kosten erstatten.¹

In an editor's note in 1794 and 1809, Nicolai explained as follows:

Dieser mein Entwurf blieb ungedruckt. Lessing rückte ihn nachher in seine theatralische Bibliothek (Th. IV. S. 3) ein, woraus er in Lessing's sämtlichen Schriften (Th. XXIII S. 269) [Berlin, 1794] als ein Aufsatz von Lessing wieder abgedruckt worden ist.²

Nicolai's letter, one should observe, indicates that on August 31, 1756, his article contained no material pertaining to English drama after 1660. In other words, the biographical sketches of at least the second and the third periods must have been added later—by either Nicolai or Lessing. Besides, inasmuch as he wanted to write a connected history of drama from 1660 to his own day, the final form of the latter part of the "Geschichte" involved a change of plan.

The whole of the "Geschichte der englischen Schaubühne" has long been generally attributed to Nicolai. In 1854, Wendelin von Maltzahn, in his revision of the Lachmann edition of Lessing's *Sämtliche Schriften*, omitted the entire article with the following comment: "Ist von Friedrich Nicolai, nach seiner eigenen Erklärung."³ The same attitude was taken by Erich Schmidt in 1884 in his monumental biography of Lessing,⁴ by Franz Muncker in 1890 in Vol. VI of the standard edition of the writer's works,⁵ and by subsequent authorities on Lessing. In fact, so far as I am aware, the only person who since 1890 has attributed to Lessing any part of the "Geschichte der englischen Schaubühne" (except for a few slight changes supposed to have been made by him) was F. C. A. Philips. In a dissertation entitled *Friedrich Nicolais literarische Bestrebungen*, he stated that Lessing completed the article, but he did not discuss the evidence.⁶

My theory is that Nicolai left his article at the stage indicated by his letter of August 31, 1756, and that in the summer or autumn of 1758 Lessing completed it for publication in the *Theatralische Bibliothek* by adding the biographical sketches of the second and the third periods and by making some changes in the remainder.

¹ *Sämtliche Schriften*, Lachmann-Muncker edition (Stuttgart, etc., 1886 ff.), XIX (Leipzig, 1904), 43.

² *Ibid.*, n. In the 1794 edition, the words "als ein Aufsatz von Lessing" are not included.

³ Leipzig, 1853 ff., IV (1854), 384 n.

⁴ Lessing, 1st ed. (Berlin, 1884-92), I, 376.

⁵ Lachmann-Muncker, VI (1890), Vorwort, p. vi, and p. 249 n.

⁶ Zalt-Bommel, 1925, p. 166.

One of the few scholars who during the last eighty years have advocated Lessing's authorship of all or a portion of the article was the unnamed editor of Vol. XI, Erste Abteilung, of the Hempel edition. He presented the following argument:

Danzel (Lessing's Leben, I. 281) erachtet zwar hierdurch [that is, through Nicolai's statements quoted in the second paragraph of the present paper] im Gegensatz zu Lachmann [in the edition of 1838-40] die Autorschaft Nicolai's als constatirt, bemerkt aber gleichwohl: "Es ist freilich auffallend, dass zugleich von dem ursprünglichen Nicolai'schen Aufsätze berichtet wird, er gehe nur bis auf die Revolution unter Karl II., während der in Lessing's Werke aufgenommene bis auf die jüngste Vergangenheit geht und nur die noch lebenden Dichter ausschliesst, so dass mindestens die dritte Periode (unten S. 714), die auch etwa nach Karl II. beginnt, man weiss nicht, ob von Lessing oder von Nicolai, später hinzugesetzt sein müsste." Und diese Bedenken Danzel's in Bezug auf die letzte Abtheilung des Aufsatzes dürften sogar durch einzelne Stellen desselben auf seinen zweiten Theil übertragen werden. So heisst es z. B. im zweiten Theil (unten S. 710): "Johann Dryden. Von Diesem und seinen sämtlichen dramatischen Werken werde ich in dem folgenden XIII. Artikel umständlich zu handeln anfangen." Da nun aber dieser XIII. Artikel "Von Johann Dryden" Lessing zum Verfasser hat und das "ich" für den XII. u. XIII. ein und dieselbe Autorschaft fast direct beweist, so ist gewiss die Möglichkeit nicht ausgeschlossen, dass auch der zweite Theil des Aufsatzes über das englische Theater, wenn nicht von Lessing verfasst, doch von ihm be- oder umgearbeitet worden. Wir erinnern übrigens daran, dass Danzel (I. 179) grade aus dem "ich" in einem ganz analogen Falle für die Aechtheit der Vorrede zu den Beiträgen argumentirt, und wollen ferner das Gewicht einer Aeusserung wie der bereits oben S. IX angeführten: "Ich nahm mir vor . . . die Zeit zu erwarten, da ich das allein ausführen könnte, von welchem ich wohl sahe, dass es gemeinschaftlich mit Andern nicht allzu wohl auszuführen sei," welche die ganze "Theatralische Bibl." betrifft, bei Lessing nicht zu gering angeschlagen wissen.⁷

The Cotta edition (1882-85)⁸ and the Deutsche National-Litteratur edition (1883-90)⁹, which also contain the "Geschichte der englischen Schaubühne," have no comment on the authorship.

Muncker gave the following reasons for assigning the entire article to Nicolai:

Keinem Tadel jedoch fürchte ich mich dadurch ausgesetzt zu haben, dass ich die "Geschichte der englischen Schaubühne" gleich Danzel und Maltzahn, deren Ansicht unter andern sich sofort Lachmann (in seinem Handexemplar seiner Ausgabe) und neuerdings auch Erich Schmidt aneignete, von Lessings

⁷ Lessing's Werke (Berlin: Gustav Hempel, [1868-79?], Vol. XI, Erste Abteilung, Vorbemerkung, pp. xvi-xvii.

⁸ Lessing's sämtliche Werke, ed. Hugo Göring (Stuttgart: J. G. Cotta), VIII, 18-43.

⁹ Lessing's Werke, ed. R. Boxberger (Berlin and Stuttgart), V, 340-67.

Schriften ausschloss. Die Worte Nicolais, der sich diese Arbeit zuspricht, lassen trotz allen Einwänden die in der Hempel'schen Ausgabe dagegen versucht worden sind, keine andere Deutung zu; überdies ist das Gepräge des Lessingischen Stiles nirgends in dem Aufsatz ersichtlich. Den Schluss des Verzeichnisses englischer Dramatiker, den Nicolai 1756 noch nicht verfasst hatte, kann er sehr wohl bis zum Druck desselben 1758 nachgeliefert haben. Das einzige Bedenken, dass dann noch gegen Nicolais Autorschaft geltend gemacht werden könnte, hoffe ich in der Amerkung zu Seite 248 [actually on page 249] durch eine Vermutung, die man wenigstens nicht ohne weiteres unwahrscheinlich oder gesucht schelten wird, gehoben zu haben.¹⁰

A footnote on page 249 reads:

Dieser Aufsatz ist von Friedrich Nicolai verfasst, nach seiner eignen Erklärung in den Anmerkungen zu seinem Brief an Lessing vom 31. August, 1756. Lessing scheint an der Arbeit seines Freundes nur eine Kleinigkeit geändert zu haben, nämlich die Worte, mit denen Nicolai in seiner Uebersicht über die englischen Dramatiker Dryden charakterisiert hatte. Diese scheint Lessing gestrichen und statt ihrer mit Rücksicht auf den nächsten Aufsatz der Theatralischen Bibliothek nur gesetzt zu haben (S. 38): 2. Johann Dryden. Von diesem und seinen sämtlichen dramatischen Werken werde ich in dem folgenden XIIIten Artikel umständlich zu handeln anfangen.¹¹

An additional objection against Lessing's authorship was presented by Josef Caro:

Von einer Besprechung der "Geschichte der englischen Schaubühne" sehe ich ab. Sie ist Nicolai zuzuschreiben, und daher von Muncker in seine Ausgabe nicht einmal aufgenommen, vgl. S. 6 des Vorwortes zum sechsten Bande seiner Werke. Hier möchte ich den Gründen, weshalb Lessing diese Abhandlung nicht geschrieben haben kann, einen neuen hinzufügen. Die Geschichte der englischen Schaubühne ist sehr dürftig, selbst wenn sie nur eine Art Chronologie geben will. Von Beaumont und Fletcher (11, 1, 703) z. B. wird kein einziges Stück erwähnt; unter Otway (710) vermissen wir *Alcibiades* und *The Soldier's Fortune*; unter Wycherley (713) das *Country-Wife*; Congreve (715) muss sich mit dem *Old Bachelor* begnügen; wo bleibt sein *Double-Dealer*? Lessing kannte und benutzte nachweislich alle diese Stücke. Die Geschichte wäre, wenn er sie verfasst hätte, viel reichhaltiger ausgefallen.¹²

THE SOURCE OF THE SKETCHES

In order to isolate the vital evidence pertaining to the authorship of the biographical sketches in the "Geschichte der englischen Schaubühne," we must first consider the source of the material. This is Theophilus Cibber's *The Lives of the Poets of Great Britain and Ire-*

¹⁰ Lachmann-Muncker, VI, Vorwort, p. vi.

¹¹ *Ibid.*, VI, 249 n.

¹² "Lessing und die Engländer," *Euphorion*, VI (1899), 478 n.

land.¹³ In 1754 Lessing had cited this work as the basis of his "Leben des Herrn Jacob Thomson,"¹⁴ and in a letter to Moses Mendelssohn on December 18, 1756, he had requested Nicolai to send him the volume of *The Lives* containing the account of Dryden.¹⁵ Later he used Cibber in connection with *Laokoon* (1766)¹⁶ and the *Hamburgische Dramaturgie* (1767-68).¹⁷

The Lives contains all the information given in the biographical sketches of the German article except the following:

1. Twenty-four plays mentioned by title (Heywood's *A Woman Killed with Kindness*, Marlowe's *Edward the Second*, and so forth) are to be found in Dodsley's *A Select Collection of Old Plays*.

2. Randolph's *The Muse's Looking Glass* is a defense of the stage (V, 355¹⁸).

3. Shirley has an ironical dedication to Prynne (V, 359).

4. There are about fifteen variations in little points—mostly in dates.

5. 'Tis *Pity She's a Whore* is a peculiar title for a tragedy (V, 356).

6. England is called "grossmütig" and "reich" (V, 361).

7. Lillo's *The London Merchant* is well known in Germany (V, 367).

8. "James Thomson, dessen Leben in dem ersten Stücke dieser Bibliothek zu finden" (V, 366).

9. "Johann Dryden. Von diesem und seinen sämtlichen dramatischen Werken werde ich in dem folgenden XIII. Artikel umständlich zu handeln anfangen" (V, 360).

10. "Von den noch lebenden will ich zu einer andern Zeit reden und die vornehmsten derselben itzt nur nennen: Young, Moore, Mallet, Havard, Jones, Whithead, Mason, Hume, etc." (V. 367).

11. "Das einzige Trauerspiel, welches er [Congreve] geschrieben, zeigt, dass das Tragische seine Sache ganz und gar nicht gewesen." *The Way of the World*, without being mentioned by title, is referred to as Congreve's best play (V, 365-66).

¹³ London, 1753.

¹⁴ Lachmann-Muncker, VI, 54.

¹⁵ *Ibid.*, XVII, 86.

¹⁶ *Ibid.*, XIV, 388.

¹⁷ *Ibid.*, XV, 45, 47, 50.

¹⁸ For references to the "Geschichte der englischen Schaubühne" here and below, the Deutsche National-Litteratur edition is used, inasmuch as the article is excluded from the Muncker edition.

12. Wycherley is designated as "dieser grosse komische Dichter." "Sein *Plain-dealer*, welchen Voltaire [in *La prude*] sehr wohl zu brauchen gewusst hat, wird für sein bestes Stück gehalten (V, 364).

13. Vanbrugh's "Lustspiele, an der zahl achte, sind in zwei Oktavbänden zusammen gedruckt. (London 1734)" (V, 366).

14. Fielding (who did not die till 1754 and hence is not treated in Cibber's *Lives* [1753]) is listed among the deceased dramatists (V, 367).

15. "Joseph Addison. Dieser ungemeine Schriftsteller verdient hier wegen seines berufenen 'Cato' eine Stelle, ob es gleich nicht wahr ist, dass dieser 'Cato,' wie Voltaire sagt, für die erste vernünftige (raisonnable) englische Trägodie zu halten, und ob er gleich auch bei weiten von der Vollkommenheit nicht ist, dass er vor allen andern den Deutschen so bekannt zu werden verdient hätte" (V, 365).

16. Special attention is directed to Mountfort's *The Life and Death of Doctor Faustus, Made into a Farce . . . With the Humors of Harlequin and Scaramouche* (V, 363), whereas in Cibber this piece is not included in the regular list of its author's plays but is mentioned merely as an adaptation (III, 47).

17. In the general introduction to the biographical sketches and in the special introduction to the third period, the statement is made that toward the end of the seventeenth century a group of "mehr feine als grosse Köpfe" brought "mehr Regelmässigkeit und Anstand" to English tragedy (V, 351 and 365).

18. Special mention is made of Marlowe's *Doctor Faustus* (V, 353), whereas in Cibber this drama is not given more prominence than the other plays of its author (I, 86).

19. In France the people of quality still sit on the stage (V, 353).

20. Prynne is to be discussed elsewhere (V, 359).

The information for the first three items of this list was obtained from Dodsley's *A Select Collection of Old Plays*²⁹—which is cited in the earlier part of the German article, and which (especially the Preface) is the main source of the connected history written by Nicolai (D. N. L. ed., V, 340-51). Most of the minor variations referred to in item 4 are probably due to typographical errors.³⁰ A few, however, represent corrections of errors in Cibber; for instance, the date of Brewer's

²⁹London, 1744.

³⁰These are not due to modern reprinting but are in the original edition of 1758.

Lingua is correctly given as 1607 (as in Dodsley), whereas Cibber has 1606. One change is an attempted correction of the discrepancy in Cibber's statements that Chapman was born in 1557 and died in 1655 (instead of 1634) at the age of 77; the German article retained the incorrect date of death and erroneously altered the year of birth to 1578.²¹ An interesting error is 1617 (instead of 1616) as the date of Shakespeare's death—an inference based upon Cibber's statements that the great poet was born in 1564 and died in his fifty-third year. The information needed for the remaining items (5-20) could have been supplied readily by a man like Lessing.

THE AUTHORSHIP OF THE SKETCHES OF THE SECOND AND THE
THIRD PERIODS

The biographical sketches of at least the second and the third periods, as has been mentioned, were not a part of Nicolai's original article. The question is: Were they added by Nicolai or by Lessing? In respect to this issue, no tangible evidence is furnished by the first ten of the twenty items listed in the previous section as not taken from Cibber's *Lives*. The first seven could be the work of either Nicolai or Lessing; No. 8 might have been written by Nicolai if he completed the article specifically for the *Theatralische Bibliothek*; No. 9 might have been substituted by Lessing for a sketch of Dryden prepared by Nicolai; and No. 10 might have been added by Lessing. Items 11-17, however, point to Lessing as the author of the portions designated as the second and the third periods. Items 18-20 belong to the biographical sketches of the first period.

Item 11 reveals a more thorough acquaintance with Congreve's plays and a keener critical judgment than Nicolai probably had. In the first sentence *The Mourning Bride* is criticized adversely—a judgment sustained by modern critics—whereas the tragedy was regarded highly by Cibber²² and by contemporary opinion in general.²³ In the second sentence of item 11, *The Way of the World* is rated as Congreve's best drama—as it is today—whereas Cibber did not make a comparative estimate. Lessing was very familiar with the plays of Congreve²⁴

²¹ The date of Chapman's birth is now generally given as ca. 1559.

²² IV, 89-90.

²³ Cf. A. W. Ward, *A History of English Dramatic Literature to the Death of Queen Anne*, 2d ed. (London and New York, 1899), III, 476-77; George Nettleton, *English Drama of the Restoration and Eighteenth Century* (New York, 1914), p. 127.

²⁴ Cf. my "Lessing's Early Study of English Drama," *JEGP*, XXVIII (1929), 24-28.

and considered him and Wycherley the greatest English writers of comedy.²⁵

Item 12 has the general tone of a person talking with authority concerning Wycherley, whose work Lessing had been studying since 1748.²⁶ The expression "dieser grosse komische Dichter" is in harmony with Lessing's special fondness for the plays of this Restoration dramatist²⁷; and the statement that the *Plain-Dealer* is regarded as its author's masterpiece is much more definite than the italicized phrase in the following passage from Cibber:

In the year 1673 a comedy of his called the Gentleman Dancing-Master, was acted at the duke's Theatre, and in 1678 his Plain Dealer was acted *with general applause*. In 1683 his Country Wife was performed at the same Theatre. These plays raised him so high in the esteem of the world, and so recommended him to the favour of the duke of Buckingham, that as he was master of the horse, and colonel of a regiment, he bestowed two places on Wycherley . . .²⁸

Item 13 suggests that the author owned a set of Vanbrugh's plays, or at least that he had ready access to it. Lessing had utilized material from Vanbrugh's *The Relapse* for *Die Juden* in 1749.²⁹ At that time (as also from May, 1758, to November, 1760), he was living in Berlin, but he could not have secured the play through Nicolai, inasmuch as the two men did not become acquainted until 1754.³⁰

According to item 14, the author was aware that Fielding, known in Germany chiefly as a novelist, had written plays and that he was deceased. Lessing, an ardent admirer of Fielding³¹ and an omnivorous

²⁵ Lachmann-Muncker, IX, 234.

²⁶ Christian Felix Weisse, *Selbstbiographie*, ed. C. E. Weisse and S. G. Frisch (Leipzig, 1806), p. 14. Lachmann-Muncker, III, 252-55; IV, 52; V, 180; IX, 140, 234; XIV, 197, 201-04; XVI, 66.

²⁷ Lachmann-Muncker, IX, 234.

²⁸ III, 251. The italics are mine.

²⁹ Cf. my "The Sources of Lessing's *Die Juden*," *Philological Quarterly*, VI (1927), 406-07. That Lessing seems to have had access to a set of Vanbrugh's works in 1758-59 is additional evidence for the conclusion that *The Relapse* is a source of *Die Juden*.

³⁰ Friedrich Nicolai, *Ueber meine gelehrte Bildung* (Berlin and Stettin, 1799), p. 40. Incidentally, in 1749 Nicolai was only sixteen years of age.

³¹ Cf. Lachmann-Muncker, IV, 323; V, 201, 432, 442; VII, 8, 59; IX, 212; XV, 62.

reader of English drama,³² is more likely to have possessed this information than Nicolai.

The incidental statement in item 12 that Voltaire utilized Wycherley's *Plain-Dealer* (in *La prude*) implies a more intimate knowledge of this French writer than Nicolai is likely to have had. Lessing, however—as is obvious from the 17th *Literaturbrief* (February 16, 1759), the *Hamburgische Dramaturgie*, and many other works—was well versed in Voltaire, the index volume of the Lachmann-Muncker edition having two and a half columns of entries under the French author's name. Moreover, the manner in which the remark is dragged in suggests the same hostility toward Voltaire as is revealed in the 17th *Literaturbrief* and other writings of Lessing. A delight to mention indebtedness, it might be added, is characteristic of Lessing. For instance, in the 17th *Literaturbrief* (February 16, 1759) he says that Voltaire's *Zaire* is a weak imitation of Shakespeare's *Othello*,³³ and in the 63d *Literaturbrief* (October 18, 1759) he ridicules Wieland for taking some passages of *Lady Johanna Gray* almost literally from Rowe's dramatization of the same material.³⁴

Item 15 has a reference to Voltaire's *Lettres philosophiques*, No. XVIII—which, together with No. XIX, had been published by Lessing and Mylius in German translation in the *Beyträge zur Historie und Aufnahme des Theaters* in 1750,³⁵ four years before Lessing and Nicolai met. This allusion, to be sure, is somewhat less significant than the one discussed in the previous paragraph, inasmuch as the two *Lettres* mentioned deal directly with English drama and hence would be more likely to be consulted by Nicolai than would *La prude*.

In this item the author of the essay contradicts Voltaire's statement that Addison's *Cato* (1713) was the first English neo-classical tragedy. Such a remark is especially appropriate for Lessing. In the first place, he must have been well acquainted with Dryden's *All for Love* (1678),

³² See "Lessing's Early Study of English Drama," *JEGP*, XXVIII (1929), 16-34; "The Sources of Lessing's *Die Juden*, PQ, VI (1927), 406-10; "Lessing's Relation to Early English Sentimental Comedy," *PMLA*, XLVII (1932), 807-26; "Lessing and Lee," *JEGP*, XXVIII (1929), 402-09; "Lessing and Burnaby," *MLN*, L (1935), 225-30; "Lessing and English Domestic Tragedy," *Research Studies of the State College of Washington*, II (1930), 130-47; "The Sources and Basic Model of Lessing's *Miss Sara Sampson*, MP, XXIV (1926), 65-90.

³³ Lachmann-Muncker, VIII, 43.

³⁴ *Ibid.*, VIII, 166-78.

³⁵ "Der erste Engländer, der ein verünftiges Stück verfertigt, und mit vieler Zierlichkeit vom Anfange bis zum Ende ausgearbeitet hat, ist der berühmte Addison." Stuttgart, 1750, p. 101.

which conforms to the rules of the three unities. After making a special study of Dryden for several years,³⁶ he announced in the "Geschichte der englischen Schaubühne" his intention of discussing this writer's works at length, published in the same issue of the *Theatralische Bibliothek* as the "Geschichte" an abridged translation of the *Essay of Dramatic Poesie*, and showed in the *17th Literaturbrief* (February 16, 1759) the influence of this essay. In the second place, Lessing is more likely than Nicolai to have had a knowledge of the English neo-classical tragedies produced just before and after 1700 by such minor dramatists as Dennis and Gildon.

The attitude toward Addison's *Cato* as reflected in item 15 reminds one of the following passage in the *17th Literaturbrief*:

Sagen Sie ja nicht, dass er [Gottsched] auch dieses zu nutzen gesucht; wie sein *Cato* est bewaise. Denn eben dieses, dass er den Addisonschen *Cato* für das beste Englische Trauerspiel hält, zeigt deutlich, dass er hier nur mit den Augen der Franzosen gesehen, und damals keinen Shakespear, keinen Johnson, keinen Beaumont und Fletcher &c. gekannt hat, die er hernach aus Stoltz auch nicht hat wollen kennen lernen.³⁷

In item 16 an interest in the Faust theme and in harlequin plays is shown. Lessing had been occupying himself with the Faust motif for several years,³⁸ and in the *17th Literaturbrief* he published a Faust scene—ostensibly to illustrate that the older German drama was more closely related in spirit to English drama than to French. Though Nicolai probably knew that his friend was working on a Faust, he would hardly have called special attention to Mountfort's farcical adaptation. In the *17th Literaturbrief* Lessing says concerning the harlequinade:

Er [Gottsched] liess den Harlequin feyerlich vom Theater vertreiben, welches selbst die grösste Harlequinade war, die jemals gespielt worden.³⁹

Many of the synopses included in "Entwürfe ungedruckter Lustspiele des italienischen Theaters," published by Lessing in the same number of the *Theatralische Bibliothek* as the "Geschichte," contain a harlequin.

The fact that the biographical sketches of the "Geschichte der englischen Schaubühne" include so many scattered resemblances to the *17th Literaturbrief* is highly significant—especially because the former were probably written first. The latter and half of the *18th Literatur-*

³⁶ Lachmann-Muncker, XVII, 86.

³⁷ Lachmann-Muncker, VIII, 42-43.

³⁸ *Ibid.*, XIX, 23.

³⁹ *Ibid.*, VIII, 42.

brief were published under date of February 16, 1759, as an issue of a very small weekly. The "Geschichte" appeared in the *Theatralische Bibliothek*, Viertes Stück, which, though evidently not distributed till the spring of 1759,⁴⁰ is dated 1758. The fourth number, consisting of 168 pages in the D. N. L. edition, must have required considerable time for preparation and printing, whereas the 17th *Literaturbrief* (exclusive of the Faust fragment) was presumably written only a very short time before its public appearance.

In the introduction to the third period (item 17), the author exhibits a detailed knowledge of English tragedy around 1700:

Ich habe gesagt, dass ich diesen Perioden von einigen mehr feinen als grossen Köpfen zu rechnen anfangte, die gegen das Ende des vorigen Jahrhunderts besonders dem englischen Trauerspiele mehr Regelmässigkeit und Anstand zu geben bemüht waren. Ich will aber damit nicht sagen, dass alle mit ihnen zugleich lebende oder auf sie folgende dramatische Schriftsteller ihres Landes die nämliche Bahn betreten. Genug, dass ihr Beispiel auf alle wenigstens so viel Einfluss gehabt zu haben scheint, um mit ihnen eine neue Klasse anfangen zu können, worüber ich mich anderwärts näher erklären werde.

This paragraph states that a few lesser lights at the end of the seventeenth century sought to give more regularity to English tragedy but that not all dramatists followed their example—whereas Voltaire (in the *Lettres philosophiques*, No. XVIII, last paragraph) merely says that after Addison's *Cato* (1713) English tragedy was more regular than before but was rather frigid. The passage just quoted has reference to the few minor dramatists who produced neo-classical tragedies just before and after 1700, such as Gildon and Dennis. These two writers, together with Flecknoe and Cotton, are mentioned at the end of the second period as representative of a group that are "weder schlecht genug noch gut genug . . . , näher gekannt zu werden." A knowledge of the neo-classical characteristics of plays by such minor dramatists as Gildon and Dennis implies much more familiarity with English drama than Nicolai probably had.

Furthermore, the last clause of the first quotation in the previous paragraph is an announcement that the matter will be explained more fully elsewhere, and the "ich" of this announcement obviously means Lessing. If made by Nicolai, this statement would hardly have been retained by his friend through an oversight, for the latter presumably

⁴⁰ Reviewed in the *Berlinische privilegierte Zeitung* on May 22, 1759. Cf. *Lessing im Urtheile seiner Zeitgenossen*, ed. Julius W. Braun (Berlin, 1884-97), I, 95-97.

read both the copy and the proof. Besides, in an article intended for the *Bibliothek der schönen Wissenschaften und der freien Künste* (for which the "Geschichte" was originally designed), Nicolai would probably have used the plural pronoun, in accordance with the practice in the first four volumes (1757-59), while he and Mendelssohn were joint editors; and Lessing could not have changed "wir werden" to "ich werde" without being aware of the announcement. Or, if Nicolai prepared the second and the third periods to complete the article for inclusion in the *Theatralische Bibliothek*, he would hardly have employed such a wording to announce something that he himself expected to write. Lessing, in announcing his "Johann Dryden und dessen dramatischen Werken," used "ich" in the same manner as in the present instance.

Moreover, as was discussed above, "Die englische Schaubühne" has some points of striking similarity to Lessing's 17th *Literaturbrief* (February 16, 1759). These seem to indicate that, if Nicolai prepared the whole of the former article himself, the biographical sketches of the last two periods can hardly belong to a date earlier than May, 1758. At that time Lessing returned to Berlin, the home of Nicolai and Mendelssohn, after having lived elsewhere since October, 1755; and his letters to those two friends during his absence do not contain the ideas involved.⁴ But if Nicolai completed the article just before it was put into type for the *Theatralische Bibliothek*, he probably did so for the purpose of having it appear in Lessing's publication, and that would almost preclude that he would use "ich" to refer to himself in the passage discussed above. In other words, the adding of the biographies of the last two periods seems to have been done by Lessing.

Muncker's objection that the "Geschichte" does not show special characteristics of Lessing's style does not apply so far as the biographical sketches are concerned. These are too brief and too much limited in content to give much opportunity for the display of distinctive characteristics of style. Likewise, Caro's argument that they are too meager to be the work of Lessing does not hold good. In view of the abundance of material given in Cibber's *Lives*, the author could use only a very small part of the information at his command. He stated specifically that he introduced the sketches merely as "ein chronologisches Verzeichnis."⁴

⁴ See footnote 60 below for additional evidence that, if Nicolai prepared the whole article, he probably did not write the latter part before May, 1758.

⁴ D. N. L. ed., V, 352.

SOURCE OF *FATIME*

Additional evidence for Lessing's authorship of the biographical sketches of the second and the third periods is to be found in the source relationship of *Fatime*.

In 1892 Erich Schmidt, in the "Anmerkungen" appended to his *Lessing*, called attention to Hebbel's *Herodes und Mariamne* (1850) with reference to the "Geheimnis" alluded to in scenes iii and ix of *Fatime* (1759).⁴³ In 1896 Marcus Landau (evidently without having seen Schmidt's inconspicuous note) stated that the fragment was probably based upon the history of Herod and Mariamne.⁴⁴ Recently Theodor Seelgen advanced the theory that Lessing relied chiefly upon the authority of Josephus.⁴⁵ That the story of Herod and Mariamne served as the source of *Fatime* is correct, but the specific version used by the dramatist is the condensed account in the *Spectator*, No. 171, quoted in Cibber's *Lives* in connection with a discussion of Fenton's *Mariamne* (1723).⁴⁶ With the exception of the immediate death of Herod (Abdalla), Addison's summary contains all the material which the first version of *Fatime* has in common with any of the other dramatizations or with Josephus (Lessing telescoping the two journeys of Herod into one and combining the characters of Joseph and Sohemus as Ibrahim-Mervan):

Fatime

Scene I. Ibrahim has been commissioned to watch Phatime while Abdalla is on a journey.

III. "Ibrahim erregt Phatime, ihn [Abdalla] mit aller Hitze der Liebe zu empfangen. Er weis nicht Worte genug zu finden, ihr die Liebe des Abdallah zu beschreiben; und verräth ihr dabey das Geheimniss." ⁴⁷

Spectator

Joseph and Sohemus on different occasions are commissioned to watch Mariamne (Phatime) while Herod (Abdalla) is on a journey.

" . . . with private orders to put her to death, if any such violence was offered to himself." "This Joseph . . . endeavored with all his art and rhetoric to set out the excess of Herod's passion for her; but when he still found her cold and incredulous, he inconsiderately told her, as a certain instance of her lord's affection, the private orders he had left behind him, which

⁴³ Berlin, 1884-92, II, 792.

⁴⁴ "Die Dramen von Herodes und Mariamne," *Zeitschrift für vergleichende Literaturgeschichte*, IX, Neue Folge (1896), 222-23.

⁴⁵ *Lessings jambische Dramenfragmente*, in "Germanische Studien" Series, Heft 81 (Berlin, 1930), pp. 94-95.

⁴⁶ IV, 165-73.

⁴⁷ Lachmann-Muncker, III, 390.

IV. "Phatime allein. Erbittert, über das was sie erfahren? [sic]"⁴⁸

V. "Abdalla, voll Feuer und Inbrunst sie wider zu sehen. Sie empfängt ihn kalt."⁴⁹

"Er klagt, weint, tobet, drohet, verspricht—Sie legt es etwas näher, und er geht ruhig ab."⁵⁰

IX. "Sie macht ihm, wegen des Aufgetragenen, bittere Vorwürfe. Er geräth in Wuth. Wirft ihr vor, dass sie das geheimniss nicht umsonst von dem Ibrahim werde erfahren haben. Geht wüthend ab, ihn aufzusuchen."⁵¹

XIV. "Sie bringen den Mervan [Ibrahim] geführt." He dies in the "Letzte Scene."⁵²

plainly shewed, according to Joseph's interpretation, that he could neither live nor die without her."

"This barbarous instance of a wild unreasonable passion quite put out for a time those little remains of affection, she still had for her lord: Her thoughts were so wholly taken up with the cruelty of his orders, that she could not consider the kindness which produced them; and therefore represented him in her imagination, rather under the frightful idea of a murderer, than a lover.

"... so that after his return, when he flew to her, with all the transports of joy and love, she received him coldly."

"But at last he appeared so well satisfied of her innocence; that from reproaches, and wranglings, he fell to tears and embraces."

"... but she... answered all his fondness, with bitter invectives for the death of her father and her brother." "She asked him, whether the private orders he left with his uncle Joseph were an instance of such an enflamed affection? The jealous king was immediately roused at so unexpected a question, and concluded his uncle must have been too familiar with her, before he would have discovered such a secret. In short he put his uncle to death.

"This confession quickly proved fatal to Sohemus, who now lay under the same suspicions and sentence, that Joseph had before him, on the like occasion."

⁴⁸ *Ibid.*

⁴⁹ *Ibid.*

⁵⁰ *Ibid.*, pp. 390-91.

⁵¹ *Ibid.*, p. 391.

⁵² *Ibid.*, p. 392.

Several of the parallel passages above even have striking verbal similarities. For instance, in Lessing's fifth scene, "Sie empfängt ihn kalt" is an actual translation of "she received him coldly."

As for the immediate death of Herod-Abdalla, Cibber specifies that in Fenton's *Mariamne* the king dies a moment after the death of the queen instead of living some years longer. Furthermore, Cibber makes the erroneous statement that in the same version, *Mariamne* takes her own life: "As he had before given the cruel orders for putting the queen to death, she, to prevent the execution of such barbarity, drank poison."⁵⁵ The fact that Lessing also has *Fatime* herself administer the poison that kills her is highly significant; as Seelgen has pointed out, *Fatime* is the only version of the Herod and *Mariamne* story in which the heroine commits suicide.⁵⁶ Finally, Cibber mentions that the *Spectator* narrative forms a part of an essay on jealousy: "In a former paper, the author having treated the passion of jealousy in various lights, and marked its progress through the human mind, concludes his animadversions with this story, which he says may serve as an example to whatever can be said on that subject." This statement presumably helped to attract Lessing's special attention, for, as is evident from the 17th *Literaturbrief*, he was interested in plays with jealousy themes at least as early as February, 1759.

The foregoing indicates that Lessing read the biography of Fenton in Cibber's *Lives* on or before August 5, 1759—the day on which he began the manuscript of the present prose dialogue of the opening scenes.⁵⁷ Moreover, he had probably made the scene-by-scene scenario⁵⁸ some time earlier, inasmuch as in it the name *Ibrahim* is used instead of *Mervan* except in scenes xi-xiv, which seem to have been added later than the remainder.⁵⁹ Besides, he may have had the plan in mind for several months before writing it down or may have been familiar with Addison's summary and the accompanying discussion of Fenton's *Mariamne* in Cibber for a while before deciding to use the material as the basis of a play of his own. In short, it is highly plausible that the dramatist read Cibber's life of Fenton during the latter half of 1758.

Lessing seems to have had no occasion to consult the biography of Fenton during the period of 1758-59 except for the purpose of obtain-

⁵⁵ IV, 170.

⁵⁶ *Op. cit.*, p. 97.

⁵⁷ Lachmann-Muncker, III, 393-95.

⁵⁸ *Ibid.*, III, 390-92.

⁵⁹ *Ibid.*, III, 392 n.

ing information for the "Geschichte der englischen Schaubühne." Even if he should have previously read Addison's summary in the *Spectator* itself, he would have had no hint to direct him to the treatment of Fenton's *Mariamne* in Cibber's *Lives*, which supplied two important elements. The "Geschichte" has the following item concerning Fenton, all of which was taken from Cibber: "Elijah Fenton, Verfasser eines sehr guten Trauerspiels, *Mariamne*, welches 1723 auf die Bühne kam. Er starb 1730."⁸⁸ In sum, the best way to explain Lessing's finding of the source material for *Fatime* is that he read the biography of Fenton in the course of preparing the latter part of "Die englische Schaubühne."

ALTERATIONS

Lessing seems to have made at least a few changes in the biographical sketches of the first period and in the connected history forming the earlier portion of "Die englische Schaubühne."

The introduction to the sketches (the five short paragraphs from "Von dieser Zeit" to "auf uns wartet") probably was added by him. It contains a statement which is also to be found in the introduction to the third period—namely, that toward the end of the seventeenth century "einige mehr feine als grosse Köpfe" brought "mehr Regelmässigkeit und Anstand" to English tragedy. As was pointed out above, this idea probably was Lessing's. Moreover, the end of the passage can hardly have been written at the time of the original portion of the article. It specifies that the author's purpose was to present merely "ein chronologisches Verzeichnis der vornehmsten Dichter," whereas Nicolai's intention was to write a "zusammen hangende Historie." Hence the division of the English dramatists from the time of Shakespeare to the middle of the eighteenth century into three periods was presumably Lessing's contribution.

The paragraph preceding the passage just discussed begins as follows: "Endlich ward zu Anfange des vorigen Jahrhunderts das englische Theater auf eine weit höhere Staffel der Vollkommenheit gebracht. Shakespeare, Beaumont, Fletcher und Ben Johnson waren die grossen Genies, die es mit unsterblichen Werken bereicherten." In the source of this material, the Preface to Dodley's *A Select Collection of Old Plays*,⁸⁹ only Shakespeare, Fletcher, and Jonson are mentioned. The name of Beaumont was probably added to the German version by

⁸⁸ D. N. L. ed., V, 366.

⁸⁹ London, 1744, I, xxi.

Lessing, for its inclusion is evidently due to Dryden's *Essay of Dramatic Poesie* (1668), in which Shakespeare, Jonson, Beaumont, and Fletcher are discussed as the leading English dramatists. Lessing was enthusiastic about this essay in 1758-59. He published an abridged translation of it in the same issue (1758) of the *Theatralische Bibliothek* as "Die englische Schaubühne," and in the 17th *Literaturbrief* (February 16, 1759) he listed the same quartet as outstanding English playwrights.*

In the sketch of Marlowe (in the first period), special mention is made of *Doctor Faustus* (item 18 on page 56 above), although the source (Cibber's *Lives*) gives no more prominence to that tragedy than to the other plays of its author. It is hard to believe that in 1756 Nicolai would have been attracted so much by the mere title of the piece as to call special attention to it. On the other hand, the statement could easily have been inserted by Lessing later. As was mentioned above, he was greatly interested in the Faust motif in 1756-59.

In the sketch of Chapman (also in the first period), the words "wie es noch itzt in Frankreich gebräuchlich ist" (item 19) may also have been added by Lessing. This dependent clause, which modifies the borrowed statement that in Elizabethan England the aristocrats and the critics sat upon the stage, is not to be found in Cibber. Voltaire, in "Dissertation sur la tragédie ancienne et moderne" (published in connection with *Semiramis* [1748]), protested against this custom; and Lessing, in the *Hamburgische Dramaturgie*, No. 10 (June 2, 1767), refers to the Frenchman's objection. In other words, we have definite evidence that Lessing (eight years later, to be sure) was particularly interested in Voltaire's protest.

Another dependent clause that gives the impression of having been added by Lessing is the announcement at the end of the biography of James Shirley that William Prynne would be discussed elsewhere (item 20): "dessen [that is, Prynne] wir ein andermal gedenken werden." Though he customarily used the singular when referring to himself in the *Theatralische Bibliothek* (of which he was sole editor), we have a precedent for the plural in a similarly worded announcement

* The inclusion of Beaumont in this passage of "Die englische Schaubühne" is additional evidence supporting the contention that, if Nicolai completed the article himself, he can hardly have done so before May, 1758 (see page 62 above). Lessing's letters to Nicolai and Mendelssohn during the two and a half years preceding his return to Berlin in 1758 make no mention of Dryden's *Essay* or of Beaumont.

at the close of "Leben des Heßrn Jakob Thomson": "deren [that is, the works of Thomson] wir hoffentlich noch einmal gedenken werden."

It is possible that Lessing added some entire sketches of the first period, but no evidence is available to decide that question.

In the connected history forming the earlier portion of "Die englische Schaubühne" (pages 340-51 in the Deutsche National-Litteratur edition), Lessing seems to have made little change. The very first paragraph, however, he evidently contributed or altered: "Ich will hier bloss die ersten Züge einer 'Geschichte der englischen Schaubühne' entwerfen, und bloss in der Absicht, damit der Leser ohngefähr wisse, wohin er die einzeln Teile derselben, die ich ausführlicher berühre, zu bringen habe." The fact that the personal pronoun is here used in the singular points to Lessing (for the same reason as was discussed above in another connection), and the second instance of "ich" obviously means him as the author of "Johann Dryden und dessen dramatischen Werken" and of contemplated articles on other aspects of English drama.

SUMMARY OF THE ARGUMENT

The argument for Lessing's authorship of the second and the third periods may be stated briefly as follows:

1. Nicolai did not lay claim to any material after 1660.
2. Some of the items contributed by the compiler of the second and the third periods imply a more thorough knowledge of English drama and of Voltaire's works, and a keener critical judgment than Nicolai probably possessed.
3. The contributed material agrees with Lessing's intense hostility toward Voltaire, his dislike of Addison's *Cato*, his delight to mention indebtedness, his special interest in the Faust theme and in harlequin plays, and his great admiration for Wycherley. All these features except the last one are also to be found in Lessing's 17th *Literaturbrief*, which was presumably written a short time later.
4. In the last sentence of the introduction to the third period, the use of the first personal pronoun in the singular implies that the author of the last two periods is the same as that of the proposed article there announced and of "Johann Dryden und dessen dramatischen Werken" (Lessing).
5. The fact that suggestions from the biography of Fenton in Cibber's *Lives*, together with a *Spectator* paper quoted there, are the source of *Fatime* (1759) indicates that Lessing read the *Lives* in 1758-59;

and the most plausible explanation is that he did so for the purpose of preparing the sketches of the second and the third periods of "Die englische Schaubühne."

6. Lessing seems to have made some changes (chiefly insertions) in Nicolai's connected history and in the biographical sketches of the first period.

LESSING'S FAMILIARITY WITH THE FAUSTUS VERSIONS OF MARLOWE AND MOUNTFORT

Interesting questions are whether Lessing was acquainted with Marlowe's *Doctor Faustus* and with Mountfort's farcical adaptation of it. Unfortunately, no direct external evidence is available, and the remains of Lessing's Faust plans and drafts and of the German versions that he may have known are too meager to provide internal evidence. The general assumption is that he was not familiar with Marlowe's tragedy; in fact, some authorities make positive statements to that effect.⁸¹ Some scholars, however—for example, Otto Heller in *Faust and Faustus*⁸²—think that Lessing probably did know Marlowe's play. The possibility of a second-hand acquaintance of a large part of it through the Mountfort version does not seem to have been taken into consideration.

That Lessing was familiar with the Faustus versions of Marlowe and of Mountfort is highly plausible. Because of the mention of them in "Die englische Schaubühne," he must have learned of their existence not later than early 1759. Now, whenever he treated a motif, he was fond of consulting a number of versions containing that motif—presumably all to which he had access.⁸³ Moreover, the fact that these two English plays are made relatively more conspicuous in the German article than in Cibber's *Lives* indicates a strong interest in them on the part of him or of Nicolai. The main issue, then, seems to be whether the dramas were available for purchase or loan.

According to Lowndes and Heinemann, the following quartos of Marlowe's *Doctor Faustus* had been published before 1759: 1604, 1609, 1611, 1616, 1619, 1620, 1624, 1631, 1663.⁸⁴ Budik mentions an octavo

⁸¹ Cf. Erich Schmidt, *Lessing*, 4th ed., ed. Franz Schultz (Berlin, 1923), I, 357; Waldemar Oehlke, *Lessing und seine Zeit* (Munich, 1919), I, 307.

⁸² St. Louis, 1931, pp. 119-21.

⁸³ Cf. my "Lessing's Early Study of English Drama," *JEGP*, XXVIII (1929), 18-19.

⁸⁴ William Lowndes, *The Bibliographer's Manual* (London, 1865), III, 1479. William Heinemann, "An Essay towards a Bibliography of Marlowe's *Tragical History of Doctor Faustus*," Part I, in *Bibliographer*, Vol. VI (1884), pp. 14-15.

of 1612, but there is no reference to Marlowe as the author.⁶⁵ Peter lists also a quarto of 1651.⁶⁶ Graf "speaks of a first edition without date, and of reprints of 1622, 1626, 1636, and 1690."⁶⁷ Concerning the editions discussed in the last three sentences, Heinemann says, "The compiler has endeavored to verify these entries. He has, however, failed to do so, and believes that, even if other editions than the quartos mentioned may once have existed, no library in England or abroad contains copies of them at the present day."⁶⁸ To be sure, no edition of *Doctor Faustus* was published during the sixty-nine years immediately preceding 1759 (ninety-six years if that of 1690, which Heinemann could not verify with an extant copy, be disregarded), and copies of the many seventeenth-century editions are rare today. Nevertheless, 175 years ago enough copies were probably still in circulation to enable Lessing to buy or borrow one if he made a special effort to secure it. About 1753 he had based *Die aufgebrachte Tugend* (ca. 1753?) upon a one-edition, almost-forgotten play that had not been published for about fifty years—Burnaby's *The Modish Husband* (1702),⁶⁹ and in 1756 he used material from a one-edition tragedy that had not been printed for twenty-three years and had been performed only twice—Charles Johnson's *Caelia* (1733).⁷⁰

As Heller has pointed out, the Hamburg Stadtbibliothek (now the Staats- und Universitätsbibliothek) acquired a copy of the 1609 quarto of *Doctor Faustus* about 1750. "The flyleaf bears the library mark of the brothers Wolf (Johann Christoph, Pastor Primarius at St. Catharine's, Hamburg, a famous orientalist and book collector of his day, and Johann Christian, Professor at the Academic Gymnasium and Librarian of the Hamburg Stadtbibliothek)." ⁷¹ Professor Dr. G. Wahl, the present Director of the Library, stated, "Sicher aber ist soviel, dass diese Faustausgabe während eines grossen Teils, vielleicht der Hälfte, des achtzehnten Jahrhunderts im Besitz der Hamburger Stadtbibliothek, also einer öffentlichen, wissenschaftlichen, gewesen ist." ⁷² Accordingly, Lessing probably had the opportunity of consulting it during his Ham-

⁶⁵ Heinemann, *op. cit.*, p. 15.

⁶⁶ *Ibid.*

⁶⁷ *Ibid.*

⁶⁸ *Ibid.*

⁶⁹ For the evidence, see my "Lessing and Burnaby, *MLN*, L (1935), 225-27.

⁷⁰ Cf. my "The Sources and Basic Model of Lessing's *Miss Sara Sampson*, *MP*, XXIV (1926), 73-76 and 84-90.

⁷¹ Heller, *op. cit.*, p. 20 n.

⁷² *Ibid.*

burg period of 1767-70. Even if it had not yet been transferred to the public library by that time, there would be a strong probability that he borrowed it from the private collection of the Wolfs, for we may take for granted that he became well acquainted with the librarian of the Stadtbibliothek. Johann Christoph had died in 1739, but Johann Christian retained the librarianship till his own death in 1770.

Lessing presumably began to look for a copy of Marlowe's tragedy about as soon as he learned of the existence of the play (provided that this was not before he became actively interested in the Faust theme). Inasmuch as the statement concerning *Doctor Faustus* in the biographical sketch of Marlowe in "Die englische Schaubühne" seems to be an addition by him, the probability is strong that he knew of this drama before taking over Nicolai's article (summer of 1758?). Such an insertion would be more likely to have been prompted by memory than by a written source, for he presumably did not ordinarily read again in Cibber the biographies of dramatists that Nicolai had already treated. Hence Lessing may well have seen the Marlowe version before publishing his first Faust fragment (February 16, 1759)—perhaps as early as 1756-57.

Mountfort's *Life and Death of Doctor Faustus* was published in 1697, 1720, 1724, and 1735. Accordingly, if Lessing made an effort to obtain access to it (as he presumably did), he was probably able to secure it. Because about half of this play was taken from Marlowe's tragedy, the German author could thus have become acquainted with a considerable portion of the latter version indirectly.⁷³

⁷³ Another medium through which Lessing could have become acquainted with a portion of Marlowe's version are the eighteenth-century English pantomimes on the Faustus theme. John Thurmond's *Harlequin Dr. Faustus* was published in 1724 (printed for W. Chetwood, London), a plot-summary and description having previously appeared in the *Universal Journal* on December 11, 1723. *The Necromancer: or, Harlequin, Doctor Faustus* (anonymous, but closely associated with John Rich) was published in 1724 (printed and sold by T. Wood) and was reprinted in the *Weekly Amusement* on July 19, 1735. These pantomimes, however, retained very little of Marlowe's original text. Moreover, Lessing probably did not read them.

ON THE DATING OF *OTHELLO* AND *LEAR*

PAUL P. KIES

The dates now generally assigned to Shakespeare's *Othello* and *King Lear*—1604 and 1605-06, respectively¹—are strengthened by the following evidence. A common element of Iago in *Othello* and Edmund in *King Lear*, who are strikingly similar villains, is that they both make their false accusations more convincing by pretending to shield the men they are really trying to incriminate—Cassio in the former play and Edgar in the latter. The fact that this is in the source of *Othello* but not in that of the Gloucester plot of *King Lear* suggests *Othello* as the earlier of the two tragedies. There is little probability that Shakespeare happened to introduce this feature independently into one play and soon thereafter reworked a story already containing it.

At this point a summary of the evidence that has hitherto been mentioned in connection with the dating of the two dramas will be helpful.² As for *Othello*, Hans Jacob Wurmsser mentioned in a diary that he attended a performance on April 30, 1610.³ The fact that the first Quarto (1622) of this play contains many oaths omitted in the first Folio (1623) suggests that the copy upon which the former was based was prepared before the passage of the "Act against Swearing" (1606). Malone over a century ago made an undocumented statement that "we know it was acted in 1604." A manuscript entitled "The Accompte of the Office of the Revelles of this whole yeres charge, in anno 1604 untell the last of October 1605," which was published in 1842 by Peter Cunningham and was restored in 1868 to the Record Office, states that "The Moor of Venis," by "Shaxberd," was performed at Whitehall on November 1, 1604, but the sheet on which this entry appears was long considered a forgery. In 1880, however, Halli-

¹ Cf. E. K. Chambers, *William Shakespeare* (Oxford, 1930), I, 461-62, 467-70; Arden Craig, *Shakespeare* (Chicago, 1931), pp. 46, 713, 717-18; Tucker Brooke, *Shakespeare of Stratford* (New Haven, 1926), pp. 120-21; William Neilson and Ashley Thorndike, *The Facts about Shakespeare* (New York, 1929), p. 76; J. Q. Adams, *A Life of William Shakespeare* (Boston, 1923), pp. 364, 373-74; Raymond Alden, *A Shakespeare Handbook*, rev. ed., ed. Oscar Campbell (New York, 1932), p. 71; Arden ed. of *Othello*, ed. H. C. Hart, 3d ed. (London, 1924), Introduction, pp. xvii-xxii; Arden ed. of *King Lear*, ed. W. J. Craig, 3d ed. (London, 1921), Introduction, pp. xv-xxiv; Sidney Lee, *A Life of William Shakespeare*, 3d ed. of revised version (London, 1922), pp. 387, 397.

² For references for the statements not specifically credited in this paragraph and the following one, see the previous footnote.

³ Shakespeare's *Othello*, ed. Henry N. Hudson (Boston, 1900), Introduction, p. 5.

well-Phillips announced that he had found among the papers left by Malone at his death a memorandum which, though not in Malone's own hand, contains most of the information of the above-mentioned entry. In 1911 Ernest Law reported that chemical tests made by James J. Dobbie indicated that the suspected sheet was genuine.⁴ The authenticity of the disputed document has since been opposed by Mrs. Charlotte C. Stopes and recently by Samuel A. Tannenbaum,⁵ but defended by A. E. Stamp⁶ and others. An early limit for *Othello* seems to be 1601, for several minor details appear to have been taken from Holland's translation (1601) of Pliny's *Natural History*.⁷ John Payne Collier sought to establish 1602 as the date, but the special evidence on which he based his case has been pronounced a forgery. Tone, style, and meter are consistent with 1604, the date now generally accepted.

King Lear, according to an entry on the Stationers' Register (November 26, 1607), was played at Court on December 26, 1606. The earliest time at which it could have been written is 1603, the year of the publication of Harsnet's *Declaration of Popish Impostures*, from which the names of Edgar's fiends and some other material were derived. Malone regarded March or April, 1605, as the most plausible date—on the theory that the popularity of Shakespeare's version was the occasion for the publication of the old *Lear* play, which was entered on the Stationers' Register on May 8, 1605. Aldis-Wright assumed a slightly later date, believing that "these late eclipses in the sun and moon" (I, ii, 113-15; see also 151 and 156) allude to the eclipses of September and October, 1605, and that the words "machinations, holowness, treachery," and so forth (I, ii, 124-25) perhaps have reference to the Gunpowder Plot (November 5, 1605); but this evidence is commonly regarded as rather weak.

Now, what is the significance of the new evidence pointed out in the first paragraph of this paper? *Othello*, if earlier than *King Lear*, was probably written before 1606 (for ample time must be allowed for the composition and the rehearsal of *Lear* by December 26, 1606), and hence 1604 is a highly plausible date—especially because *Macbeth* also seems to belong to 1605-06.⁸ Then, on the assumption that *Othello* was written in 1604, the period of 1605-06 is particularly plausible for *King Lear*.

⁴ *Some Supposed Shakespeare Forgeries* (London, 1911), *passim*.

⁵ Tannenbaum, *Shakespeare Forgeries in the Revels Accounts* (New York, 1928; *More about the Forged Revels Accounts* (New York, 1932).

⁶ *The Disputed Revels Accounts* (Oxford, 1930).

⁷ Arden ed. of *Othello*, Intro., pp. xxi-xxii.

⁸ Cf. Chambers, *op. cit.*, I, 473-75; Craig, *op. cit.*, p. 721; Neilson and Thorndike, *loc. cit.*; Brooke, *loc. cit.*; Adams, *op. cit.*, p. 375; Lee, *op. cit.*, p. 394; Arden ed. of *Macbeth*, ed. Henry Cunningham, 3d ed. (London, 1925), Intro. pp. xxix-xxxvi.

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